Manitoba

Annual Report 1987 - 88

Energy and Mines

89-01673/

Manitoba

Minister of
Energy and Mines

Room 301
Legislative Building
Winnipeg, Manitoba, CANADA
R3C 0V8

(204) 945-4601

The Honourable George Johnson
Lieutenant Governor of the Province of Manitoba

May it please your Honour:

I have the honour of presenting to you the Annual Report of the Department of Energy and Mines for the fiscal year ending March 31, 1988.

This report records the activities of the Department and the performance of the mineral resources and energy sectors of the province during the year.

Respectfully,

Harold Neufeld
Minister

Manitoba

Deputy Minister of
Energy and Mines

Room 309
Legislative Building
Winnipeg, Manitoba, CANADA
R3C 0V8

(204) 945-3130

The Honourable Harold Neufeld
Minister of Energy and Mines

Dear Sir:

I have the honour to present the Annual Report of the Department of Energy and Mines for the fiscal year ending March 31, 1988. The report contains a descriptive and statistical record of activities and achievements in the mineral and energy sectors during the year.

Charles S. Kang
Deputy Minister

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Department of Energy and Mines

Manitoba is endowed with substantial mineral and energy resources. The development of these resources and subsequent production into commercially attractive and marketable commodities underpins a large part of the socio-economic fabric of the province. Extraction of mineral resources and generation of electricity from hydro resources play an important role in sustaining the economic growth of the province. These resources are viewed as a natural heritage which must be managed prudently, and developed under responsible policy guidelines to ensure that residents of the province, today and in the future, will benefit.

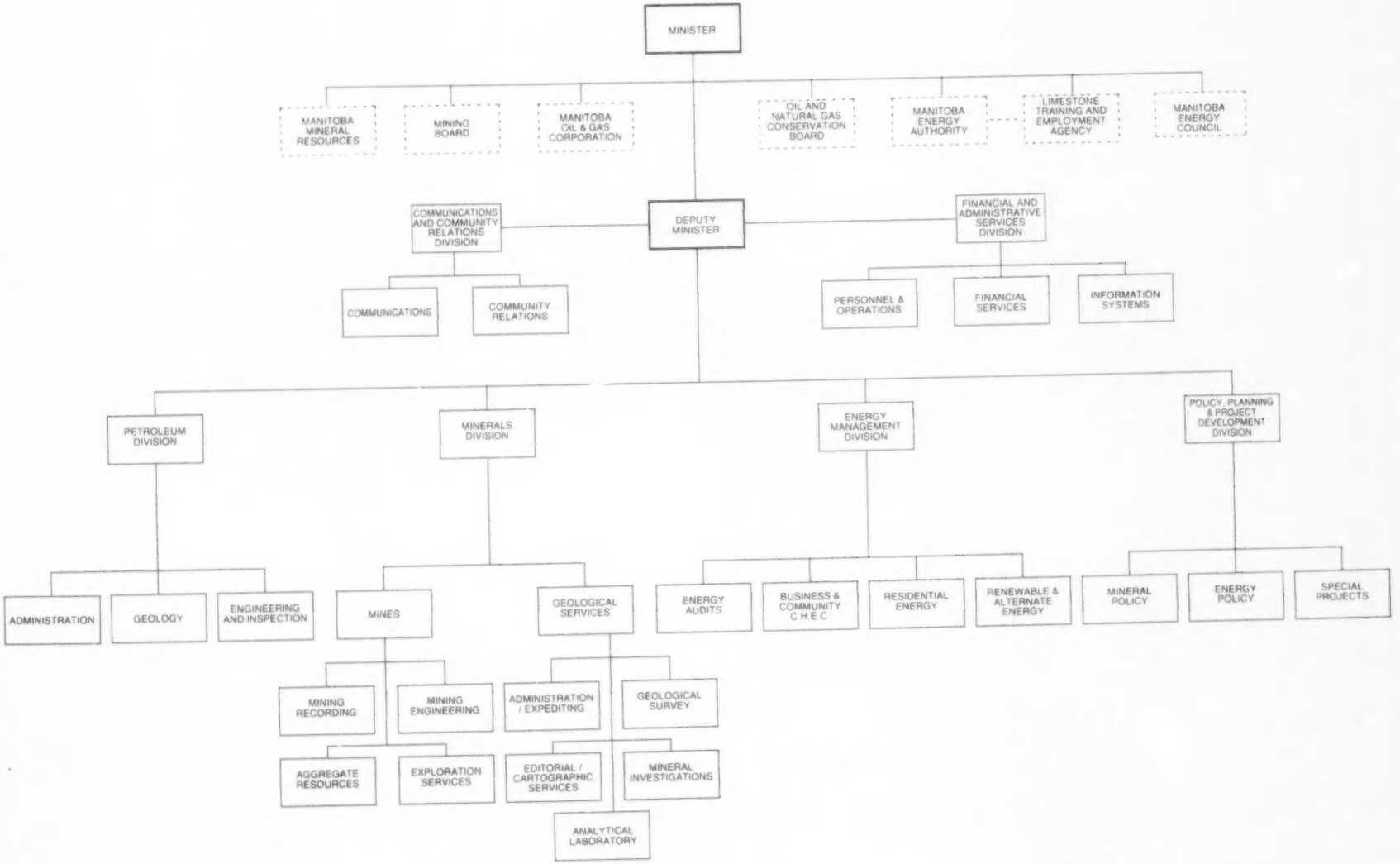
The medium and long-term direction of the department, in addressing its mandate, is to ensure continuity and enhancement of future benefits from provincial mineral and energy resources.

During the year, these functions were carried out by four main divisions — Energy Management, Minerals, Petroleum, and Policy, Planning and Project Development — with support from the Financial and Administrative Services Division and the Communications and Community Relations Division. Additionally, the Minister held responsibility for the following crown corporations and boards: Manitoba Hydro, Manitoba Mineral Resources Ltd., Manitoba Oil and Gas Corporation, The Mining Board, The Oil and Natural Gas Conservation Board, Manitoba Energy Authority, and Manitoba Energy Council. Manitoba Mineral Resources Ltd., Manitoba Oil and Gas Corporation, and Manitoba Energy Authority produce their own annual reports.

A summary of expenditures of the department for the year ending March 31, 1988 is given in Table 1.

Organization Chart — Manitoba Energy and Mines

MANITOBA ENERGY AND MINES DEPARTMENTAL OVERVIEW



Energy Management Division

The Energy Management Division is responsible for the promotion of appropriate energy conservation and renewable and alternative energy substitution strategies for Manitoba.

The mandate of the Division is to:

- develop public awareness of proper energy management;
- provide opportunities for the application of proven technologies;
- cost-effectively reduce energy consumption throughout Manitoba's economy; and
- encourage renewable and alternate energy forms.

Responsibility is divided into three sectors: Residential; Industrial, Commercial, Institutional and Agricultural; and Renewable and Alternative Energy.

Residential Sector

Home CHEC-UP

The Home CHEC-UP program helps homeowners conserve energy by providing impartial advice on home retrofits. A specially trained Energy Advisor conducts an energy analysis of the home and provides the owner with a report outlining an energy conservation program and details of recommended retrofit techniques.

The Home CHEC-UP is free, administered by Energy and Mines, and delivered by Manitoba Hydro. In fiscal year 1987/88, 4,753 homes were analyzed. Since program inception, 14,909 homes have had a Home CHEC-UP.

Cut Home Energy Costs (CHEC)

The Cut Home Energy Costs Loan Program (CHEC) provides financial assistance, in the form of two loan options, to homeowners wanting to implement a conservation program.

The first option requires a Home CHEC-UP and provides up to $2,500 to finance the implementation of the Home CHEC-UP Energy Advisor's recommendations. The second option offers up to $1,000 but does not require a Home CHEC-UP. Both loan options have an interest rate of 8%, fixed for 3 years, and are repayable over a maximum period of 10 years in monthly installments on the homeowner's hydro bill.

The CHEC Loan Program is administered by Energy and Mines and delivered by Manitoba Hydro and Winnipeg Hydro, in their respective service areas. During fiscal year 1987/88, 3,604 loans valued at $3,770,400 were disbursed. In addition to energy conservation, benefits of the program include employment opportunities in the province's construction industry and an improved housing stock. Since program inception in 1977, 53,061 loans have been disbursed at a value of $41,549,200.

Home Energy Savers Workshops

Workshops on home energy conservation methods are delivered in schools throughout the province. During fiscal year 1987/88, 22 workshops were delivered to a total of 360 participants. The workshops also effectively promote the Home CHEC-UP/CHEC Loan programs.

Home Retrofit Booklet Series

The How-to-Retrofit booklets provide homeowners with objective information on proper retrofit techniques. The booklets offer a detailed guide for do-it-yourself clients and contractors. Five of the six booklets have been published to date. Since their launch in mid-1986, more than 80,000 booklets have been distributed.

Retailer Training Seminars

To complement the Home Retrofit Booklet series, the department developed training seminars on energy conservation techniques for delivery to building supply store personnel during fiscal year 1988/89.

Energy Conservation Programs for Community-Based Organizations

This program stimulates energy conservation and creates employment opportunities for minorities and special interest groups by providing grants to non-government organizations active in energy conservation and alternative energy services.

During fiscal year 1987/88, the following two projects, administered by Energy and Mines, were undertaken.

1. **Kinew Housing** is a non-profit housing corporation that provides low cost rental accommodation to Native families. The Kinew Energy Program funds upgrading and retrofitting of Kinew's homes, providing major energy cost savings for the corporation's low-income tenants. The program also trains Native people, enhancing their job opportunities in the retrofitting and construction industries. In fiscal year 1987/88, 142 homes were retrofitted at a total expenditure of $70,000.
2. **The Age and Opportunity Centre** operates an energy conservation program designed to assist elderly residents to upgrade the energy efficiency of their homes. The program's energy co-ordinator visits seniors and provides energy advice and assistance. In fiscal year 1987/88, 218 homes were visited at a total expenditure of $35,000.

Industrial, Commercial, Institutional & Agricultural Sector

Manitoba Energy Audit Program

This program promotes effective energy management in industrial, commercial and institutional facilities. Energy managers and senior employees are shown how energy is used in their facilities and how to improve energy efficiency and reduce costs. Initiated in 1980, the program has completed energy audits of over 1,400 Manitoba industries, businesses, institutions and community based organizations as of March 31, 1988.

Program staff inspect the facility's operation, analyse its current energy use, identify areas of potential savings and present the results to the client. The program currently operates two computer equipped audit vehicles (the Energy Buses) staffed by engineers and technologists, and capable of providing complete on-site service. The audit techniques have evolved over the life of the program to smaller, more efficient computers, more effective presentations and general improved program capability.

In the 1987/88 fiscal year, 182 facilities were audited, which identified $1.03 million in potential energy savings. Since the start of the program, a total of $19.7 million in energy savings have been identified.

Business/Community CHEC (Cut High Energy Costs) Loan Program

This program offers financial assistance for viable non-residential energy conservation projects. Participants are eligible for a loan of 80% of the project cost (up to $32,000) at the same favourable interest rate provided to government agencies. Loan payments are sized according to the potential savings with a maximum term of five years.

Small businesses, institutions and community based groups are eligible for the program. By March 31, 1988, over $500,000 in Business/Community CHEC loan funds were approved, with a total of $318,000 disbursed. Completed construction costs were in excess of $400,000.

The Energy Manager

This publication uses case studies of Energy Bus clients to promote the opportunities and benefits of energy efficiency. Two issues were produced in fiscal 1987/88, covering a large school division and five smaller facilities. "The Energy Manager" is well received and offers an excellent, low-cost way to promote energy management.

School Energy Management Seminars

Energy Management seminars are delivered to School Divisions to train their staff in energy management techniques. In addition to developing the seminar package, staff delivered three highly successful seminars this year.

Renewable & Alternative Energy Sector

Canada-Manitoba Agreement on Conservation and Alternative Energy

An Agreement was signed in June of 1986, allowing for joint funding of demonstration projects and other activities by Manitoba Energy and Mines and Energy, Mines and Resources Canada. The Agreement ended March 31, 1988.

Twelve activities were funded under the Agreement in 1987/88. Reported funding levels represent Manitoba's share.

1. **Ground Source Heat Pump Study**
   The Industrial Technology Centre/Manitoba Research Council received $32,399 to complete a techno-economic and market study of the use of ground source heat pumps for heating and cooling of industrial, commercial and institutional buildings. They reported significant potential applications for this technology in Manitoba, but identified several barriers to development.

2. **Energy Efficient Fluorescent Lighting Demonstration**
   Winnipeg School Division No. 1 received $13,500 to demonstrate savings available from energy efficient fluorescent lamps and ballasts. Demonstration results will be useful to operators of all types of buildings where lighting is a significant load. A report is due by September 1988.

3. **Monitoring of Residential Gas Furnaces and Boilers**
   Unies Consulting Engineers Ltd. of Winnipeg received $14,534 to study the savings actually achieved when older gas fired furnaces and boilers were replaced with new, higher efficiency units. A final report is due in late 1988.

4. **Gas Furnace Retrofit Demonstration**
The Conserver Group Inc., a Winnipeg consulting engineering firm, received $4,500 to study the technical and economic feasibility of field retrofitting conventional residential gas furnaces with induced-draft forced venting and spark ignition systems, in order to save energy and increase safety of operation. A report on this ongoing project is due in March 1989.

5. **Pro-Trucker**
The Manitoba Trucking Association (MTA) received $25,000 from Manitoba Energy and Mines to administer the Pro-Trucker program. Pro-Trucker assists the trucking industry, including fleet owners, owner/operators and drivers to reduce fuel consumption and costs.

6. **Computer Aided School Bus Routing and Scheduling Demonstration**
Portage la Prairie School Division No. 24 received $13,500 to purchase and demonstrate software for computer aided school bus routing and scheduling. The technology promises to improve pupil transportation and reduce energy and equipment costs, and could be applied in many Manitoba school divisions.

7. **Demonstration of the Connor Shea Zero-Till Seed Drill for Pastureland Rejuvenation**
The Prairie Agricultural Machinery Institute received $7,341 to demonstrate a novel low-energy soil-conserving seeding device. Positive results were reported in the first year of a multi-year monitoring program.

8. **Ethanol Production from Potato Processing Wastes**
W.L. Wardrop and Associates Ltd. receive $1,500 to complete a study of the feasibility of ethanol production from starch wastes at Carnation Foods' Carberry potato processing plant. Carnation Foods is now pursuing development of an ethanol plant on the basis of a positive recommendation.

9. **Biomass Energy Institute Inc.**
The Biomass Energy Institute (BEI) Inc. is an internationally recognized, Winnipeg-based resource centre on renewable energy. The BEI received $10,000 to improve the accessibility of its library and to purchase reference materials.

10. **Energy Management Workshops — Manitoba Association of Urban Municipalities and Manitoba Association of School Trustees**
The Manitoba Association of Urban Municipalities received $13,548 to prepare and host three two-day workshops on energy management in municipal buildings. Seventy-two building supervisors attended. The Manitoba Association of School Trustees received $1,280 to conduct a one day energy management seminar for energy facility supervisors. Fourteen supervisors attended. Manitoba Energy and Mines and Energy, Mines and Resources Canada directed and provided staff for the workshops and seminar.

11. **Intergovernment Energy Analysis Program Coordinators' Workshop**
Manitoba Energy and Mines hosted and contributed $2,050 towards a national workshop for staff from various provinces responsible for energy analysis and associated programs.

12. **Manitoba Energy Conservation Week**
Manitoba Energy and Mines contributed funding and staff towards promoting and running Manitoba Energy Conservation Week, held February 15-20, 1988. Activities included industrial and home energy workshops, media presentations and a school poster contest. A similar week is planned for 1989.

13. **Poster Calendar**
A 1988 poster calendar displaying children's art, with the theme "I Use Energy Wisely: at School and at Home," was produced and distributed to over 9,500 teachers. Manitoba Energy and Mines contributed $4,245 towards the calendar production.

Manitoba Energy Council

The Manitoba Energy Council is a citizens' advisory group appointed by the Minister. The Council consists of a chairperson, secretary and eight members. The council provides the Minister with assessments and recommendations concerning energy policy and conservation programs.

Minerals Division

The Minerals Division is responsible for the administration and management of the provincial mineral resources.

The Division:

- administers The Mines Act and Regulations governing the disposition of metallic and quarry mineral rights, and the exploration, development and production of provincial mineral resources;
- develops and implements mineral resource programs in response to changing technologies, the state of the mining industry, and government policy;
- conducts geological investigations which provide a data base for mineral resource exploration, evaluation and development;
- monitors the effect of provincial mineral policy on the mining industry and participates in mineral policy formulation and implementation;
- negotiates mineral resource development arrangements with potential developers and federal government agencies; and
- advises other provincial and federal agencies on matters relating to the environment, land use planning, regional development, etc.

Geological Services Branch

The Geological Services Branch comprises four sections: Geological Survey; Mineral Investigations; Analytical Laboratory; and Editorial and Cartographic Services.

The Geological Survey and Mineral Investigations Sections undertake geological mapping, mineral deposit studies and other geoscientific investigations, providing an up-to-date geological framework and mineral data base for the province for use in mineral resource appraisal, land-use planning, and in addressing environmental concerns.

The Analytical Laboratory Section provides the necessary analytical support for the branch's geological and mineral evaluation activities. The Editorial and Cartographic Services Section prepares all maps, graphs, charts, and illustrations for the Mineral Resources Division, and edits all branch publications and reports.

During 1987, the fourth year of the (1984-89) Canada/Manitoba Mineral Development Agreement (MDA), geological surveys and investigations were conducted in Manitoba by the provincial and federal Geological Surveys. This year's program entailed a slight shift in emphasis from field investigations to office compilation, data analysis, and report production.

The MDA Management Committee approved the joint workplan for Sector "A" (Geoscientific Activities) in March and distributed copies to the six members of the newly expanded Mineral Exploration Liaison Committee (MELC). The MELC brings together mineral industry representatives and key Minerals Division staff.

Forty-six provincial and twenty-two federal projects were mounted with operational budgets of $792,000 and $1,515,000, respectively. Of combined expenditures, 23 per cent were spent in the Lynn Lake region and 37 per cent went to the Flin Flon-Snow Lake region. The remaining 40 per cent was evenly divided between Southeast Manitoba, the Churchill-Superior Boundary Zone, the Gods and Island Lakes region, and Winnipeg-based compilations.

Ten Applied Geoscience Research Agreements with the Department of Geological Sciences, University of Manitoba, were sponsored under the MDA, five each by the Geological Survey of Canada (GSC) and the Manitoba Geological Services Branch (MGSB).

In 1987, although most projects continued work initiated in earlier years, several new projects grew out of industry recommendations. Where possible, existing projects were modified to respond to specific requests from exploration personnel.

Prior to the field season, staff outlined program plans to industry representatives in each of the regions, and at the April meeting of the Winnipeg Branch of the Canadian Institute of Mining and Metallurgy (CIM). A draft Sector "A" Progress Report for 1986/87 was also tabled at the CIM meeting, with the final version distributed June 29. Pamphlets listing MDA projects scheduled for 1987 were distributed throughout the province in late May. Other publications were released throughout the year.

Eight Manitoba-specific papers were given by MGSB staff, and nine by GSC geologists at the Geological Association of Canada-sponsored Symposia on "Gold in Central Canada" and the "Trans-Hudson Orogen" convened in May 1987 at Saskatoon.

Survey crews were deployed in May, with provincial operations supported by 25 students who were employed and trained for a combined total of 1684 days.

In the Precambrian sector of the province, survey personnel gave field tours and demonstrations for industry, university and government geologists working in the Kisseynew region, at Herb Lake, in the Churchill-Superior Boundary Zone, in Southeast Manitoba (building stone deposits), and in the Bissett-Bird River region (U.S. National Aeronautics and Space Administration research into anorthosites and granitic plutons).

In the Phanerozoic sector, field tours examined Paleozoic sequences, as one of Manitoba's contributions to the 5th International Williston Basin Symposium, and the 2nd International Symposium on the Devonian System, hosted by Canadian Society of Petroleum Geologists.

A 13-day field demonstration of Quaternary chronology and glacial deposits in Manitoba, Saskatchewan and Alberta was led by MGSB personnel (in concert with the GSC and Saskatchewan) as part of the Canadian-hosted XIIth International congress of the International Union for Quaternary Research.

Assistance was also provided to a feasibility study investigating the probable impact of iceberg scouring on seafloor pipelines.

In addition to their mandated activities, MGSB personnel provided advisory and editorial services to other Sectors of the Agreement. These included: production of a Geological Highway Map of Manitoba; an Earth Sciences Film Program for schools; educational pamphlets, presentations and tours for foreign investors and exploration executives; and the production of a brochure on Manitoba's industrial minerals. By year-end, over 11 000 copies of the highway map had been distributed at conventions and through the Information Centre and InfoBus, the CSPG, and the Manitoba Department of Education.

Price Waterhouse completed an Interim Evaluation of the MDA in July 1987. Industry comments provided insight into the usefulness of MDA activities, as well as suggestions for new initiatives and improved services/liaison. The evaluation concluded that "during the first three years of its implementation (the Canada/Manitoba MDA) is generally well founded, efficiently managed and producing tangible results."

In a broader context, at the Mines Ministers' Conference in St. John's, Newfoundland, the MDA mechanism for delivering government-sponsored, industry-supportive minerals programming received favourable comment from industry, the geological community, and senior officials from both levels of government. Manitoba also prepared a brief to the Ministers entitled, "Mineral Development Agreement Support for Regional Economic Development; the importance of government geoscientific activities" on behalf of the Committee of Provincial Geologists.

In late September 1987, MELC representatives canvassed exploration interests in their respective regions for project proposals for a successor agreement (1989-94) to the current MDA, as well as suggestions for changes to the focus, level and emphasis of Survey programming in the longer term. These proposals were incorporated into the 1988-89 Workplan. They also provided a principal reference in developing a five year plan for geological surveys and exploration-supporting minerals investigations under a successor agreement.

This year's Report of Field Activities (205 pages) contains contributions from the Geological Survey of Canada, describing the results of their current MDA work in Manitoba. These contributions, together with a GSC-generated preliminary geological map and report of the Elbow Lake area, complete the roster of Sector "A" progress reports covering the summer of 1987.

Sixteen new preliminary Precambrian maps include a 1:1 000 000 compilation of sub-Phanerozoic basement geology in Hudson Bay Lowland, and a 1:20 000 map of Elbow Lake by the GSC. The results of the 1987-88 field program were presented in a series of talks and displays at the annual Meeting with Industry in Winnipeg on November 23 and 24 (332 attendants including 232 guests).

During the winter months, MGSB and GSC personnel gave six talks on various aspects of MDA work to Branch meetings of the Canadian Institute of Mining and Metallurgy in Lynn Lake, Thompson and Flin Flon.

For the balance of the year, provincial and federal staff compiled and analysed materials and data from previous field seasons, and produced reports and talks for various technical seminars in Manitoba and across Canada.

MDA displays were also featured at the Geological Survey of Canada Forum in Ottawa (January 19 and 20, 1988, 638 registrants).

From September 1987 to March 1988 MGSB staff responded to over 375 enquiries, in addition to exchanges at the Meeting With Industry and 230 enquiries during the annual Prospectors and Developers Association Convention in Toronto (March 6-9, 4300 registrants).

All geoscientific technical publications and other output generated during fiscal 1987-88 are listed in Table 13. A detailed summary of the year's field work is contained in the Sector "A" Progress Report.

Analytical and Geochemical Laboratory

The Analytical and Geochemical Laboratories provide assays, geochemical analyses or complete silicate analyses of samples from Manitoba prospectors and Branch geologists involved in mineral deposit studies and mapping. In addition, spot tests, mineral identification and analyses were provided to the general public and other government departments. In the 1987/88 fiscal year, the Analytical Laboratory provided 4 477 assay determinations, 18 035 silicate analyses

and 10 spectrographic determinations. The Geochemistry Laboratory performed 15 112 geochemical determinations.

Editorial and Cartographic Services

Editorial and Cartographic Services supply advisory and technical support in the preparation of geological reports for Geological Services, Mines Branch and Petroleum Division. Reports prepared during the fiscal year are listed in Table 13.

In the Bedrock Geology Compilation Map Series, one final map was published — Oxford House (53L); two preliminary maps were released — Kenora (52E) and Pointe du Bois (52L); and two maps are in final stages of preparation — Herchmer (54E) and Northern Indian Lake (64H). The 1987 Report of Field Activities contains 40 provincial papers and 20 federal (GSC) papers on various aspects of Manitoba's geology and mineral resources; 23 preliminary maps were released together with the Report of Field Activities at the Meeting with Industry. A desktop publishing system was acquired and used to prepare several open file reports and aggregate resource reports.

The first report in the Mineral Deposit Series was prepared, incorporating figures drawn on an Autocad system. A French version of the Geological Highway Map was prepared, with the assistance of the Geological Survey of Canada. Both English and French versions of the map were released on November 21, 1987.

A popular report on the Gold Deposits of Manitoba, prepared jointly with Exploration Services, was also released. It sold out during the year and was reprinted.

Rock Preparation Laboratory

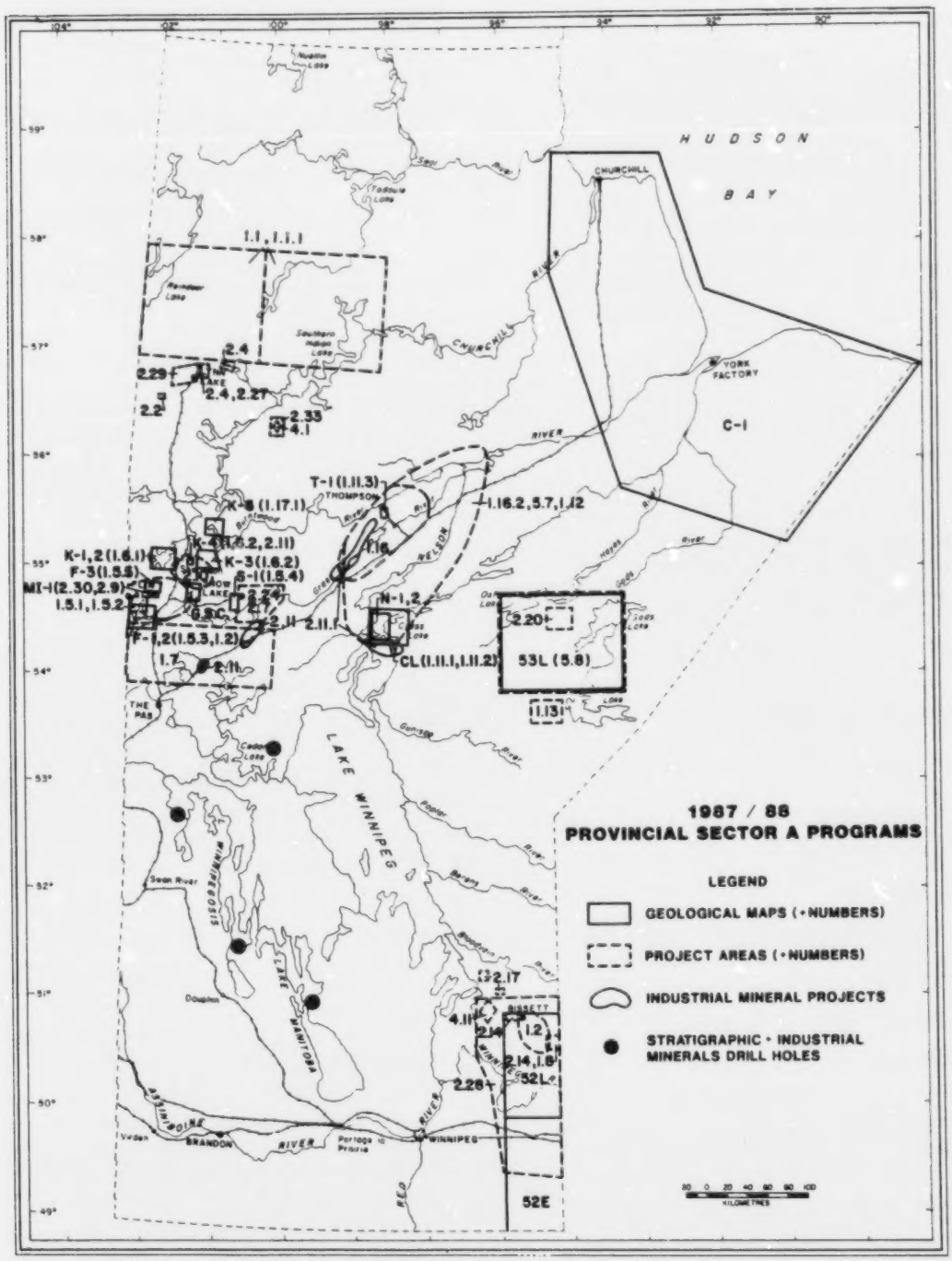
During the year ending March 31, 1988, the Rock Preparation Laboratory completed 2,162 thin sections, 975 stained slabs and 761 polished slabs. The laboratory also prepared 1,234 samples for chemical analysis.

The Rock Preparation Laboratory maintained a Precambrian rock and two petroleum core warehouses. Support was also provided to 35 requests from the petroleum industry to review core.

The Rock Preparation Laboratory was also involved in a summer core hole program in which 30 holes were drilled for a total of 1 462.80 metres. Of these, 18 were for building stone, eight were for stratigraphic interpretation and eight in Project Cormorant area.

The Rock Preparation Laboratory was also involved in a winter drill program in which seven holes were drilled for a total of 764.5 metres.

Figure 1
Location of Provincial Projects 1987/88



Location of Provincial Projects 1987/88

Location of Field Projects, 1987

Map Legend

Lynn Lake District

1.1 Geological mapping, Big Sand-Brochet area
by D.C.P. Schledewitz

1.1.1 U-Pb zircon geochronology, Lynn Lake region (R.V.S.)
by R. Van Schmus (University of Kansas) and D.C.P. Schledewitz (MGSB)

1.2 Uranium-lead isotope investigations, Southern Churchill Province
by E.C. Syme, A.H. Bailes (MGSB), and T.M. Gordon (GSC)

1.3/1.16 Rubidium-strontium geochronology in Manitoba
by G.S. Clark (University of Manitoba)

2.2 Gold deposits, Johnson Shear
by D.A. Baldwin

2.4 Rock geochemistry, biogeochemistry and stratigraphy of the Agassiz Metallotect
by M.A.F. Fedikow

2.5 Industrial Minerals evaluation, Lynn Lake area
by W.R. Gunter and P.H. Yamada

2.27 Remote sensing: Agassiz Metallotect
by M.A.F. Fedikow, W. Moon and V. Singh (University of Manitoba)

2.29 Mineral deposit documentation, Lynn Lake area
by D.A. Baldwin

2.33 Mineral deposit documentation, Ruttan Lake Area
by D.A. Baldwin

4.1 Basal till investigations, Lynn Lake-Leaf Rapids area
by E. Nielsen

5.1.2 1:250 000 geological compilation, Churchill River
by M.T. Corkery, P.G. Lenton, and D.E. Kowerchuk

5.3 Lynn Lake report and maps
by H.V. Zwanzig, H.P. Gilbert and E.C. Syme

Flin Flon District

1.5.1 and 1.5.2 1:20 000 scale geological mapping, Flin Flon area
by A.H. Bailes and E.C. Syme

1.5.3 1:20 000 scale geological mapping, Athapapuskow Lake area
by E.C. Syme

1.5.4 1:20 000 scale geological mapping, Chisel-Morgan Lake area
by A.H. Bailes

1.5.5 Tartan Lake mapping
by M.P. Gilbert

1.6.1 1:50 000 scale geological mapping of the Kississing Lake area
by D.C.P. Schledewitz

1.6.2 Kisseynew East, geological mapping
by H.V. Zwanzig and P.G. Lenton

1.7 Scout drilling, Project Cormorant area
by W. Weber, H.R. McCabe, W.D. McRitchie, I.T. Hosain and D. Berk

2.7 Gold deposits, Snow Lake area
by M.A.F. Fedikow

2.9 Mineral occurrence documentation, Flin Flon area
by G.H. Gale

2.10 Kisseynew sedimentary gneiss terrain
by G. Ostry

2.11 Industrial minerals investigations, Flin Flon-Snow Lake Region
by W.R. Gunter

2.12.2 Geological setting, Vamp Lake deposit
by P. Laznicka, R. Wadien (University of Manitoba) and G.H. Gale

2.24 Copper-zinc deposits, Snow Lake area
by M.A.F. Fedikow

2.30 Mineral deposit geology, Flin Flon
by G.H. Gale

2.31 Metallogeny of felsic intrusive rocks
by N.M. Halden (University of Manitoba) and G.H. Gale

Southeast Manitoba

1.8 Rice Lake geological mapping
by W. Weber

2.14 Mineral occurrence documentation, Rice Lake greenstone belt
by P. Theyer

2.15 Genesis of the Gatlan and related gold occurrences, Wallace Lake area
by P. Theyer and R. Gaba (Seasonal Assistant)

2.17 Platinum group element potential, Bird River area
by P. Theyer

2.28 Dimension stone resource assessment
by B.E. Schmidtke

4.1.1 Overburden investigations in the Manigotagan-English Brook area
by E. Nielsen (MGSB), R.N.W. DiLabio (GSC) and E. Mongrain (University of Ottawa)

Thompson-Cross Lake District

1.11.1/ 1.11.2 Cross Lake, geological mapping and regional evaluation
by M.T. Corkery, H.D.M. Cameron and P.G. Lenton

1.11.3 Thompson belt supracrustal rock investigations
by J.J. Macek

1.12 Field support for northern Superior U-Pb geochronology program
by W. Weber in cooperation with T. Krogh, L. Heaman and N. Machado (Royal Ontario Museum), and the GSC

1.15 Project management
by W. Weber

1.16 Rubidium-strontium isotopic studies of selected rock units in northern Manitoba
by G.S. Clark (University of Manitoba)

1.16.2 Thompson belt geochemistry
by N.M. Halden (University of Manitoba)

2.20 Rare-element enriched pegmatite evaluation
by P. Cerny (University of Manitoba) and G.H. Gale

5.7 Thompson-Pikwitonei compilation
by W. Weber, J.J. Macek, W.D. McRitchie and H.V. Zwanzig

Northern Superior District

1.13 Bigstone Lake-Ponask Lake mapping
by W. Weber and K.L. Neale

Manitoba General

2.21 Lead-zinc potential of carbonate rocks in southern Manitoba
by G.H. Gale

2.26 Industrial minerals mapping, Duck Mountain
by B.E. Schmidtke

4.1.2 Lead-zinc potential of carbonate rocks in southern Manitoba
by E. Nielsen

5.12 Mineral deposit compilations
by G.H. Gale

Mines Branch

The Mines Branch, through its component sections, administers matters relating to mining, smelting and refining operations; recording of mineral dispositions; monitoring exploration activities and reviewing assessment reports; the rehabilitation of mining lands; aggregate resource inventory studies; and the implementation of provincial land use policy regarding the conservation of aggregate resources. During the year the Branch was also responsible for activities under Sector B of the Canada/Manitoba Mineral Development Agreement.

Mining Recording

Mining Recording Section staff in Winnipeg and The Pas administer regulations under The Mines Act governing the disposition of Crown mineral rights other than oil and natural gas. The regulations enable individuals and companies to acquire claims, permits and leases to prospect, develop and mine Crown minerals. The Section processes applications for these mineral dispositions; monitors and inspects the activities of disposition holders: collects fees, rents, royalties and refundable performance deposits; maintains records; and answers enquiries about its functions.

During calendar year 1987, 1,075 mining claims were recorded covering a total area of 212 139 hectares, compared with 301 974 hectares in 1986. Mineral dispositions in good standing at the end of 1987 are given in Table 3. Details of Crown mineral dispositions issued during 1987 are given in Table 4.

Total revenue collected by the Section during the fiscal year was $1,840,366, comprising $1,107,142 from dispositions, other fees and rentals; $75,033 from The Mining Claim Lease Tax; and $658,191 from royalties on industrial minerals (see Table 2).

Royalties from industrial minerals production increased $$658,191 in 1987/88 compared with $576,278 in 1986/87, reflecting an increase in activity in the construction industry.

Mining Recording Offices in Winnipeg and The Pas continued work on a computerized Mining Recording Information System to better serve the mining industry. The system is projected to be fully operational in October 1988.

Aggregate Resources

Aggregate Resources undertakes detailed surficial geological mapping, aggregate resource inventories, and prepares quarry mineral land use recommendations based upon provincial land use policies. Resource inventory data and resource management proposals are provided to government, municipalities and private sector users.

Economic evaluations of sand and gravel deposits were undertaken by staff geologists in the Rural Municipalities of De Salaberry, Louise, Morton, Roblin and Winchester, the Local Government District of Reynolds and in the Cross Lake area.

In response to requests from Municipal Planning Districts, data for the protection of quarry mineral resources were compiled and forwarded to resource management geologists. All proposed Crown land transfers, land subdivisions and zoning by-law amendments were reviewed and, where necessary, aggregate information compiled to reduce potential land use conflicts with mineral extraction. Staff geologists serve on a variety of technical advisory review committees and prepare recommendations for major land use concerns.

Four geological reports and five preliminary maps were released during the year and are listed in Table 13.

Exploration Services

The Exploration Services Section, with seven professional and two clerical staff, provides support to mining companies and prospectors engaged in mineral exploration in Manitoba. The Section monitors, promotes and documents exploration activity in the province; examines assessment work on mineral dispositions for compliance with the regulations under The Mines Act and disseminates non-confidential data; distributes publications; collects and stores diamond drill core; compiles, disseminates and publishes geological reports and exploration and mineral deposit data; prepares interpretative geophysical maps of active exploration areas; compiles bibliographies and indexes to Manitoba geology; and performs land use, mineral potential studies.

The mineral inventory, geological compilation, bibliographic and expanded drill core collection projects are currently conducted by three term geologists under the Canada/Manitoba Mineral Development Agreement (MDA), 1984-89. One of these geologists was appointed to the new Resident Geologist position in The Pas and will be responsible for, amongst other things, the drill core libraries program.

During the fiscal year, 261 reports of exploration work were received and assessed; 673 files were microfilmed; 73 reports were added to the non-confidential files; 617 files were reproduced for the private mining sector; 1,248 open files were examined by mining industry personnel and 794 by staff, and 293 visits were made by mining company personnel. Revenue generated by the sale of assessment reports

was $3,031.32. In May and November two supplements to the computerized "Index to Non-confidential Assessment Reports" were released. Index maps showing the areal extent of non-confidential exploration work were updated.

During the year the sale of 576 geological publications and maps generated $15,565.83 in revenue. Department staff distributed 422 complimentary and free publications. Three publication release notices for 16 new publications and 23 preliminary maps were mailed to the 750 addresses on the mailing list. The price list was revised four times during the year with 100 copies printed each time.

Exploration activity summaries were compiled each month and an annual 1987 summary report was distributed at the March convention of the Prospectors and Developers Association of Canada. Displays, pamphlets and brochures on exploration in Manitoba and the work of the MDA, the Section and the Geological Branch were presented at the Annual Meeting with Industry, the Prospectors and Developers Annual Convention in Toronto, and the Manitoba Schools Career Symposia in Winnipeg, Brandon and Flin Flon. An article was prepared for the "Northern Miner" on junior company activity and flow-through expenditures in Manitoba.

Exploration companies and prospectors provide drill core on a voluntary basis in exchange for assessment work credits for the transportation costs. Having the non-confidential core available for examination eliminates the need for costly duplication of diamond drilling, and allows for more productive use of exploration dollars.

Under the drill core acquisition and storage program, a total of 2 679 metres of core was collected in seven field retrievals in northern Manitoba during the year. As of March 31, 1988, the department's drill core inventory was approximately 173 000 metres, stored at four regional core libraries: Lynn Lake (46 000 metres), The Pas (70 000 metres), Thompson (29 000 metres) and Winnipeg (28 000 metres).

Library improvements and reorganization projects were completed in all buildings and a continuing program of selective reduction of core from high density drill projects resulted in the removal of 2 010 metres from the system. A computerized core box labelling system is now being used, and the manual National Topographic System-based data files on all holdings were updated. Preparation of a detailed computer-based index to all holdings continued. There were 13 inspection visits at the core libraries during the year, consisting of 45 days of use. The bilingual brochure on the libraries program was updated and promotional efforts have increased industry awareness and interest in this service.

Assessment data were used to conduct geophysical interpretation studies of 150 surveys to update the 1978 publication on the Flin Flon-Snow Lake district. The report is now ready for publication. The Mineral Properties file (MINPROP), which tables summary statistics on mineral producers, potential producers and past producers in Manitoba, was updated and assisted government employees and industry.

The Mineral Education Series booklet "Mining in Manitoba" was published as well as the "Bibliography of Manitoba Geology 2" (Open File Report OF88-1), which supplements "B.M.G.1" (OF86-1). This interactive computer bibliography database now contains 6,400 references. Plans are underway to extend computer searching to PC users via the DATAPAC network. Searches by NTS area as well will be available in 1989.

"Gold Deposits of Manitoba" (Economic Geology Report ER86-1) was released and all 270 copies sold out in two months. This publication will be reprinted early in the next fiscal year. Platinum and chromite mineral inventory cards were compiled and updated and pegmatite cards are being revised.

Mining Engineering and Inspection

Staff made regular visits to the underground mines in the province to monitor their operation. Special emphasis was placed on two operations receiving financial aid from the Government of Manitoba.

A total of 3,053 inspections of pits and quarries monitored compliance with The Mines Act and Regulations. These included both private and Crown operations. Technical advice on good mining and rehabilitation practices was provided to the industry and other branches of government.

During 1987, staff directed and supervised Crown aggregate production in excess of 2.6 million tons by 263 permit holders. Production reports and royalty payments from both Crown permits and Crown leases were subject to field verification.

Input was provided on interdepartmental review committees concerning the development of rehabilitation regulations and Clean Environment Orders dealing with the reclamation of mines.

All proposed Crown land transfers, subdivisions, development plans and zoning by-law amendments during the year were reviewed. Where necessary, technical recommendations were made to minimize potential conflicts with mineral extraction.

Under the Canada/Manitoba Mineral Development Agreement, the province funded 16 research projects on mining and mineral processing. Eight projects related to new mining technology, three to safety and

productivity and five to mineral processing. Six projects were contracted to Manitoba mining companies, five to outside consultants and one to the University of Manitoba. Two projects were conducted by Mines Branch staff. Assistance was given as required in 18 research projects under federal funding. The provincial expenditure was $435,000.

Two joint industry/government briefing sessions on mining and mineral processing projects were held at Thompson and Flin Flon.

The Mining Industry

Mineral Production

The estimated value of mineral production for the 1987 calendar year, including metals, industrial minerals and fuels, was $1,014.9 million, compared to $763.9 million for 1986, an increase of 33 percent (see Tables 5 and 6). At $759.8 million (up 42 percent from 1986), metals accounted for 74.9 percent of the total value of Manitoba's 1987 mineral production. The value of the more significant metals produced during 1987 were: nickel $386.1 million (up 55.9 percent); copper $172.6 million (up 29.3 percent); zinc $84.3 million (up 12.9 percent); gold $71.4 million (up 70.2 percent); and silver $11.3 million (up 19.2 percent).

Mining and Processing Operations

Metallic Minerals

Mining operations in Manitoba are in the Flin Flon-Snow Lake area, the Lynn Lake-Leaf Rapids area, and at Thompson and Bernic Lake (see Map 1).

Hudson Bay Mining and Smelting Co., Limited operates a number of mines in the Flin Flon-Snow Lake area, concentrators at Flin Flon and Snow Lake, copper smelting and zinc and cadmium refining facilities at Flin Flon and the Ruttan mine and concentrator at Leaf Rapids. Besides ores from the company's own mines, the Flin Flon operation also processed concentrates from the Trout Lake Joint Venture during 1987. The principal products from Hudson Bay's Manitoba facilities are anode copper, refined zinc, refined cadmium and lead concentrate. At the end of 1987, approximately 2,000 people were employed at the company's mines and processing facilities in Manitoba. An additional 295 people were employed at company operations on the Saskatchewan side of the border.

In the Snow Lake area, the company operates six mines. The 3 000 tonnes per day concentrator at Stall Lake produces copper and zinc concentrates which are shipped to Flin Flon for further processing, and a lead concentrate which is shipped to Trail, B.C. The Chisel Lake, Ghost Lake, Stall Lake, Anderson Lake, Spruce Point and Rod mines operated continuously.

In the Flin Flon area, mining operations were maintained at the Centennial and Flin Flon mines, and the Trout Lake Mine, operated under a joint venture agreement (Hudson Bay Mining and Smelting Co., Limited 44 percent, Scandinavian Minerals Syndicate 29 percent, and Manitoba Mineral Resources Ltd. 27 percent). The production suspension at the Westarm Mine, begun in 1985, continued throughout 1987.

During the year Inco Limited operated the Thompson underground mine, a concentrator, smelter and nickel refinery at Thompson. The Birchtree Mine remained on a standby basis. The Thompson Open Pit achieved a production rate of 6500 tonnes per day by the end of 1987. The Thompson open pit mines the crown pillar of the Thompson orebody and replaces the Pipe open pit which ceased production in 1984. The main product from the Thompson complex is electrolytic nickel. By-products include copper matte, cobalt oxide and pentlandite concentrate.

Copper matte is shipped to the company's refinery at Copper Cliff, Ontario, while commercial grade cobalt oxide is shipped to the company's refinery at Clydach, Wales, where refined cobalt oxides and salts are produced. Pentlandite concentrates are sold as feed for Sherritt Gordon Mines Limited's nickel refinery at Fort Saskatchewan, Alberta.

During 1987, Inco's smelting and refining operations at Thompson did not receive any nickel concentrates from the company's mine at Shebandowan, Ontario. Shipments ceased in 1986.

An average of 1,833 persons were employed at Inco's Manitoba operations during 1987.

Sherritt Gordon Mines Limited operated the Ruttan mine and concentrator in Leaf Rapids, located 96 km southeast of Lynn Lake, until July 1987, when they were sold to Hudson Bay Mining and Smelting Co., Limited.

Figure 2
Gross Value of Manitoba's Mineral Production 1970-87

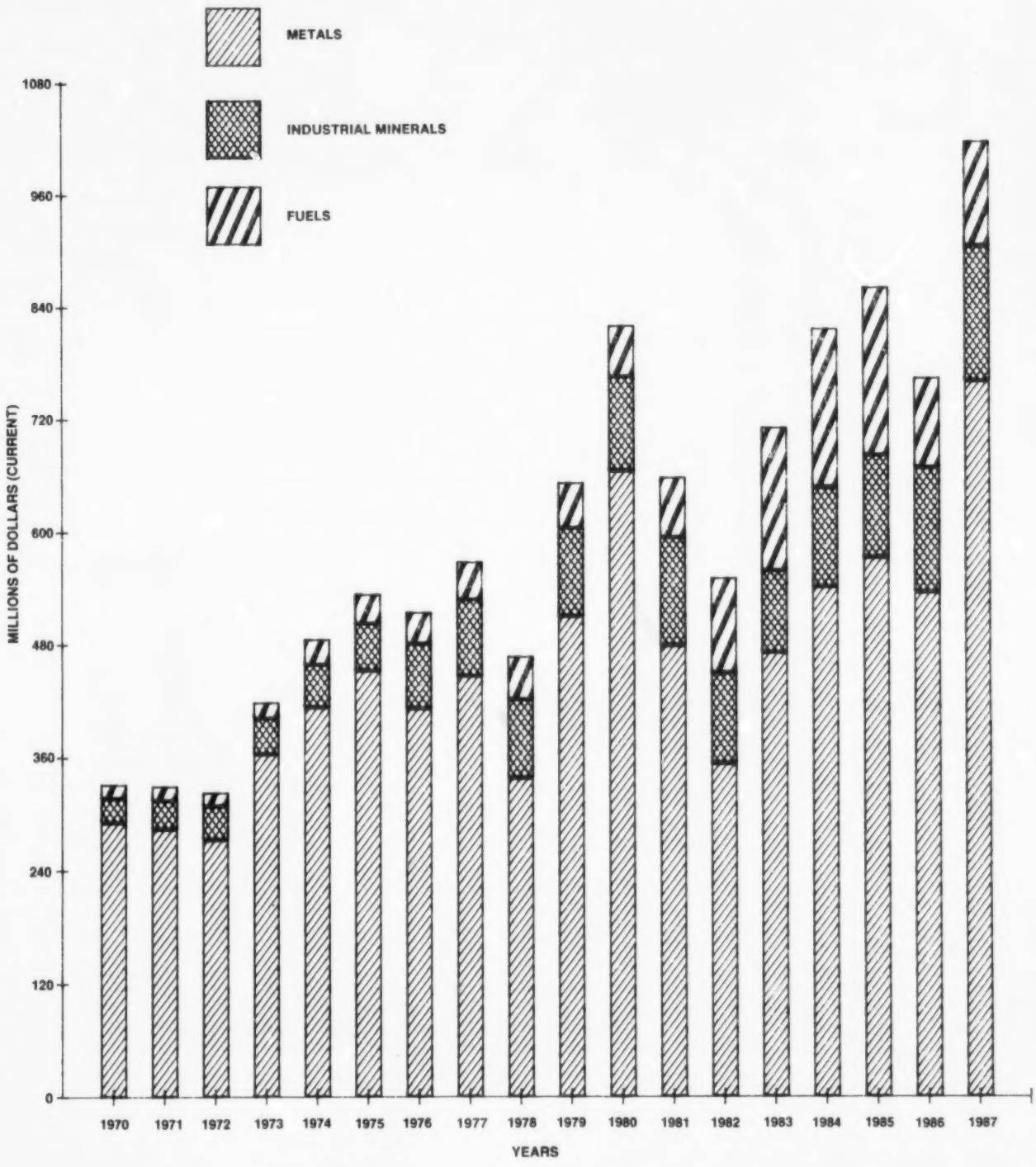


Figure 3

Manitoba's Mineral Production as a Percentage of the Gross Domestic Product 1972-87

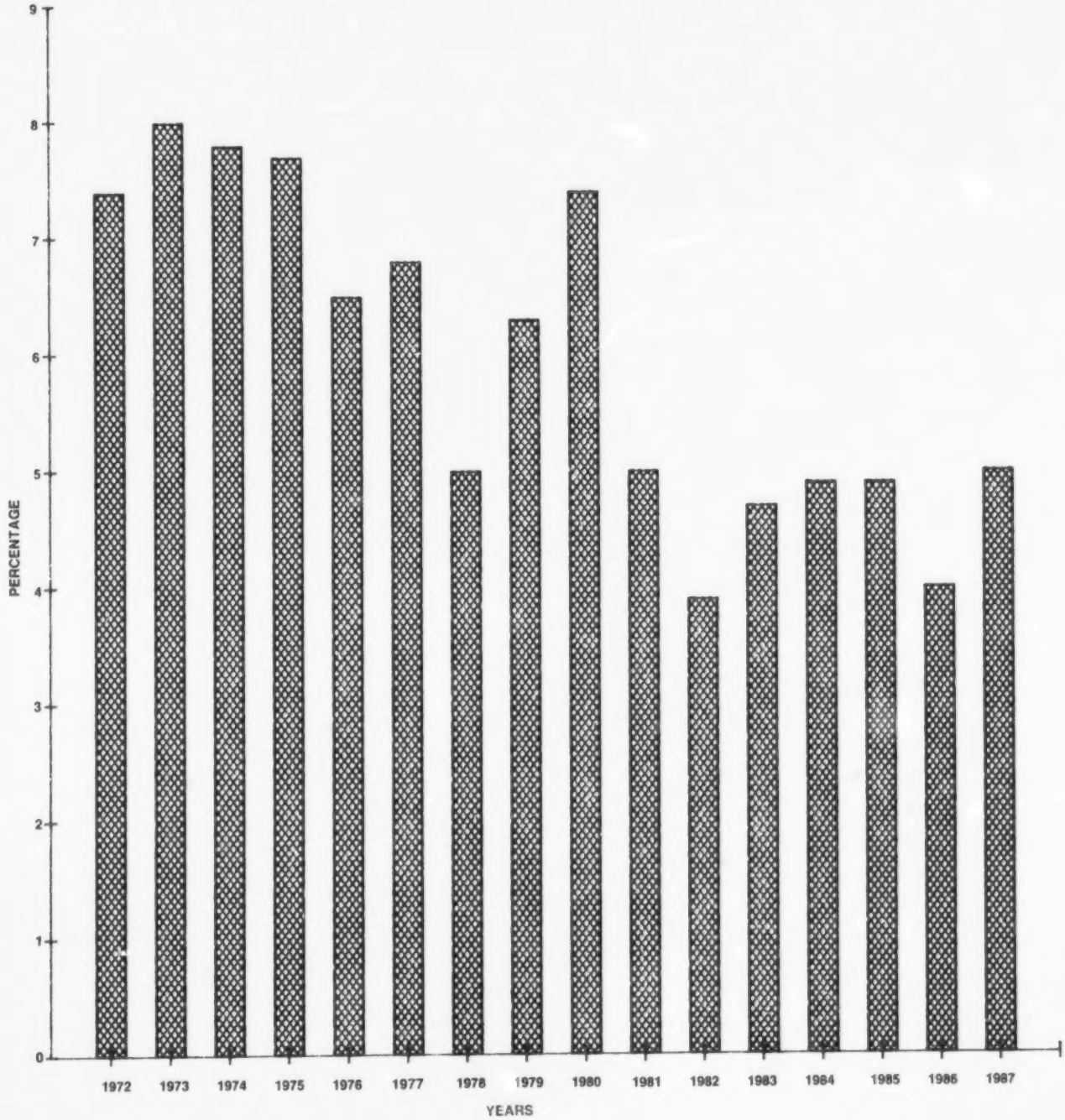
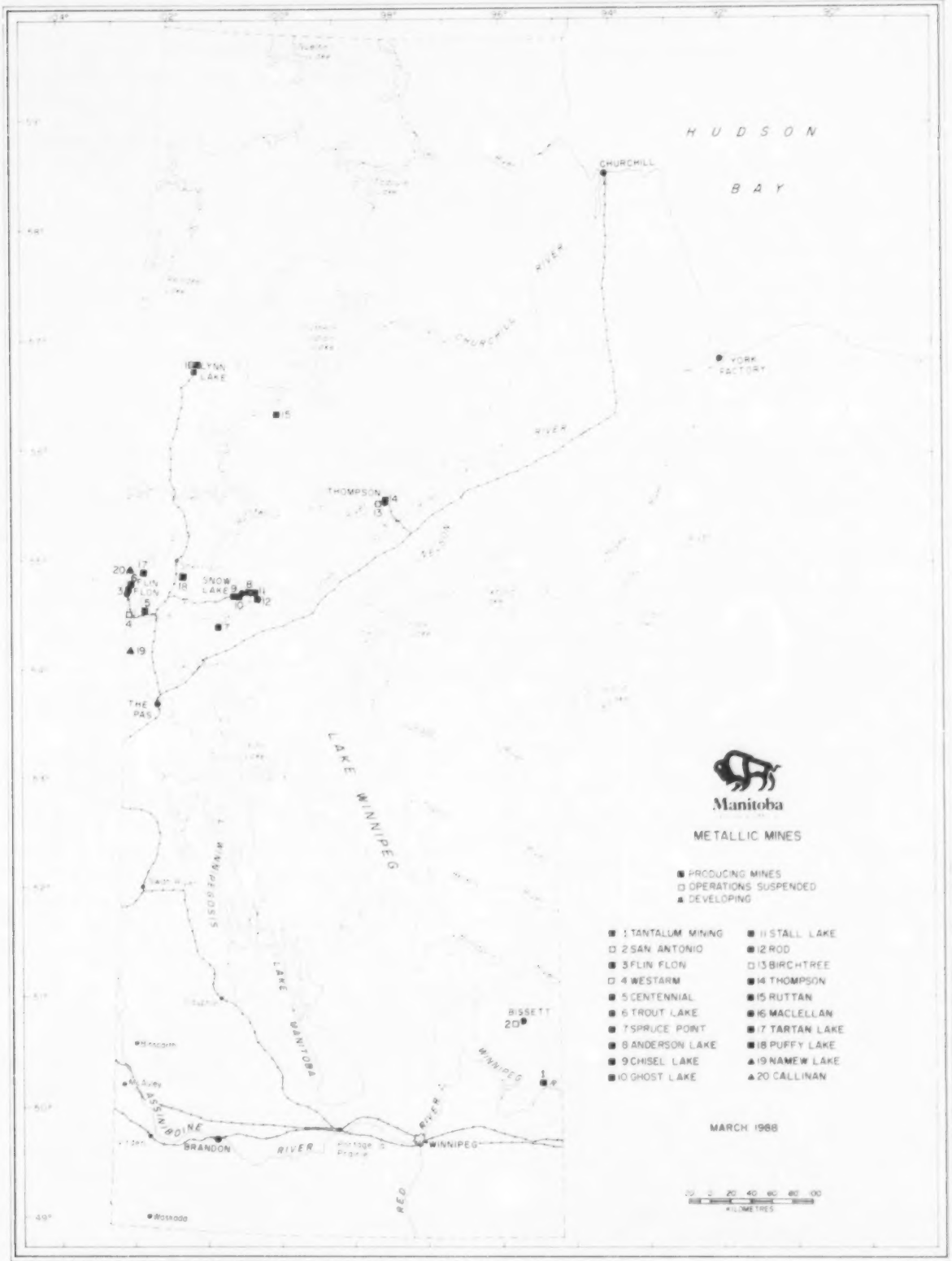


Figure 4 Location of Metallic Mines in Manitoba



In 1984, Sherritt Gordon approved a $28 million mine development program, aided by a $10 million loan from the Manitoba Government. Completion of this project has allowed Sherritt Gordon to increase production and employment levels and reduce production costs.

Copper and zinc concentrates produced at the Ruttan mill are trucked to Lynn Lake for rail shipment to Flin Flon, where both zinc and copper concentrates are treated, and to Noranda's operations in Quebec where some of the copper concentrates are processed.

Tantalum Mining Corporation of Canada Limited (TANCO)

Tantalum mining operations at Tanco's Bernic Lake mine remained suspended during 1987. However, most of the stockpiled concentrate at Bernic Lake was sold in 1987 as the tantalum market showed signs of improvement.

In November 1987, in view of Tanco's securing several multi-year contracts for tantalum concentrates, the decision was taken to initiate a $4.7 million project to refurbish the mill to produce both spodumene and tantalum simultaneously. Construction is anticipated to be completed in August 1988.

In 1984, Tanco, with financial assistance from the federal government, established a pilot plant by modifying the existing tantalum mill to produce a high quality, low iron, spodumene concentrate for use in the manufacture of such items as Corning Ware and similar competitive end products. As a result of favourable tests, sales were made to plants in the U.S., France and Japan. A new spodumene processing plant was built by Tanco at a cost of $6.4 million. At the end of 1987, 50 people were employed at Tanco's Bernic Lake operations. When construction on the mill is completed, the workforce will increase to about 100 employees.

Precious Metals

MacLellan Mine

In June 1985, Sherritt Gordon decided to bring the MacLellan gold mine into production. The MacLellan mine (formerly known as the Agassiz deposit) is located eight kilometres northeast of Lynn Lake. Bringing the MacLellan mine into production softened the impact of the closure of the Fox Mine by providing employment for most of the Fox mine employees and helped sustain the community of Lynn Lake, albeit at a reduced level. The MacLellan mine is operated by SherrGold Inc., which is 60 percent owned by Sherritt Gordon and 40 percent publicly owned. Under an agreement between Sherritt and SherrGold, Sherritt manages the operation of the mine. Although full production was scheduled for the end of 1986 with a planned annual rate of 65 000 ounces of gold and 100 000 ounces of silver, it did not achieve this production rate until the end of 1987.

At the end of 1987 SherrGold had 277 employees.

San Antonio

Opened in 1932, the San Antonio gold mine in Bissett closed in 1968 when a fire destroyed the hoistroom. The mine was reactivated during 1982 and operated until May 1983 under a joint venture agreement between Brinco Mining Limited and New Forty-Four Mines Limited, with Brinco the operating partner. Later in 1983 all operations were terminated.

In 1985, Canadian Nickel Company Limited, a subsidiary of Inco Limited, began an exploration and evaluation program to earn an equity position in the San Antonio Mine, but later dropped the option.

Whiteshell Ventures

Goldbeam Resources Ltd. and its wholly owned subsidiary Whiteshell Ventures Ltd. completed exploration and feasibility studies on its properties near Star Lake in the Whiteshell Park. A development program was submitted for review by the Parks Branch of the Department of Natural Resources. A work permit was issued in February 1984 for a mining operation in the park, with ore to be trucked to a milling site outside the park boundaries. Financing arrangements were still being pursued in 1987.

Industrial Minerals/Structural Materials

The production and value of industrial minerals and structural materials for 1987 are given in Table 5 in the Statistical Supplement.

A large face-brick plant at Lockport, near Winnipeg, is operated by Red River Brick & Tile, using stoneware clay from the Ste. Rose du Lac area, shale from the Pembina Mountain area, and sand from local sources. The plant supplies bricks for the mid-Canada and central-northern United States markets.

Non-swelling bentonite, used mainly in clarification of petroleum and vegetable oils, is mined by Pembina Mountain Clays Inc. near Morden and shipped to the company's plant in Winnipeg for treatment with sulphuric acid to increase its absorbency. Pembina Mountain is the only producer of non-swelling bentonite in Canada.

Gypsum is produced by Domtar Construction Materials Ltd. at Gypsumville for use in the company's wallboard plant in Winnipeg. Westroc Industries Limited, also produces gypsum at Harcus, near Amaranth for its wallboard plants in Winnipeg and Saskatoon.

Portland cement production comes from the plant of Inland Cement Limited at Fort Whyte, using local clay and silica sand and limestone quarried by Canada Cement LaFarge Ltd. at Steep Rock. Lime-

stone is also quarried north of Mafeking by Inland, to supply the company's cement plant at Regina.

Steel Brothers Canada Ltd. produces lime from kilns in Winnipeg and Faulkner. Gillis Quarries Limited quarries limestone and dolomite at Garson for building stone, and numerous operators produce crushed rock in the Interlake region and elsewhere. Cold Spring Granite (Canada) Ltd. and 128112 Canada Inc. (Canadian Shield Quarries Ltd.) operate granite quarries in the Lac du Bonnet area primarily for use as building stone. High quality silica sand quarried from Black Island in Lake Winnipeg by Selkirk Silica Division of Marine Transport Limited is exported for use in glass-making, as foundry sand, for sand blasting, and as a filtering medium.

Peat moss is produced from sphagnum bogs in southeastern Manitoba and used in horticulture. Fisons Western Corporation operates four bogs near Moss Spur, Julius and Elma. A fifth bog near Giroux was brought into production in the spring of 1983 by Premier West Peat Moss Ltd. Both companies produce a "value-added" product, combining fertilizer with the peat moss.

Mineral Exploration

Expenditures on mineral exploration in Manitoba for 1987 are expected to exceed the 1986 estimate of $36.0 million. Diamond drilling on surface exploration was 277 138 metres, compared to 175 583 metres in 1986, an increase of 58 percent. The 1985 figure was 153 716 metres.

The total area of claims recorded in the province during 1987 decreased 30 percent to 212 139 hectares, from 301 974 hectares in 1986. The 1985 figure was 136 736 hectares. Mineral dispositions (which include claims, permits and leases) in good standing at the end of the year totalled 1 518 950 hectares, compared with 1 433 717 hectares at the end of 1986 (an increase of 6 percent) and 1 332 159 hectares at the end of 1985. The many dispositions acquired in 1984 and 1985 were consolidated and explored in 1986 and 1987. The number of individual exploration projects reported during 1987 decreased to 234 from 244 in 1986.

A sustained interest in the gold potential of Manitoba's "greenstone" belts was a major factor in the continued high level of exploration activity. Gold and base metals dominated the exploration scene in and around the greenstone belts of Lynn Lake, Flin Flon-Snow Lake, Island Lake, Gods Lake, Seal River and southeastern Manitoba. There was also minor exploration activity for nickel, platinum and pegmatite minerals.

Base Metals

In the Flin Flon-Snow Lake Belt, exploration activities included geological, geophysical, geochemical and diamond drilling programs. Companies active in this area were Hudson Bay Exploration and Development Company Limited, Granges Exploration Ltd., Falconbridge Limited, Esso Minerals Canada, Cominco Ltd., Manitoba Mineral Resources Ltd., Noranda Exploration Company Limited and a few junior companies and local prospectors.

Hudson Bay Mining and Smelting Co., Limited and Outokumpu Mines Ltd. plan to have their Namew Lake nickel-copper deposit, located 60 kilometres south of Flin Flon, in production by the fourth quarter of 1988. Shaft sinking was completed to a depth of 410 metres in early 1988 and a 1900 tonne per day concentrator is being constructed.

An amended joint venture agreement between Hudson Bay Exploration and Consolidated Callinan Flin Flon Mines Limited facilitated financing of further underground exploration and development of the copper-zinc deposit which straddles the Saskatchewan-Manitoba border one mile north of Flin Flon.

Hudson Bay Mining and joint venture partners Granges Exploration Ltd., Manitoba Mineral Resources Ltd. and Outokumpu Mines have approved a new 640 metre production shaft at the Trout Lake Mine.

Hudson Bay Mining and Smelting Co., Limited plans an open pit to extract the crown pillar of the Chisel Lake zinc-copper deposit.

A promising discovery made in 1987 was the base-precious metals find of Westfield Minerals Limited and its partner Goldbrae Development Ltd. on Big Island in Manistikwan Lake, eight kilometres east of Flin Flon. A major drill program was underway early in 1988 with two rigs testing the zone.

At Morgan Lake, southwest of Snow Lake, Granges Exploration Ltd. completed a drill program on this sub-economic deposit. Falconbridge, Cominco and Manitoba Mineral Resources conducted geophysical surveys and drilling in the belt.

In the Lynn Lake Belt, exploration in eight base metals projects included geology, geophysics, geochemistry and diamond drilling. Active companies were Sherritt Gordon Mines Limited, Manitoba Mineral Resources Ltd., Hudson Bay Exploration and Development Company Limited and Granges Exploration Ltd.

Hudson Bay Mining and Smelting Co., Limited purchased the Ruttan Mine in 1987 from Sherritt Gordon and plan an exploration program on the "West Anomaly" near the mine.

Noranda Exploration Company Limited undertook base metal exploration projects, consisting of geology, geochemistry, geophysics and diamond drilling in the more remote belts of central eastern Manitoba. Along the "Thompson Nickel Belt," Inco Limited carried out seven projects which included geological and geophysical work as well as diamond drilling.

A major mining development project was announced by Inco to develop an orebody between the 730 metre and 975 metre levels at the north end of its Thompson mine. Production is expected in 1988.

Gold

The greenstone belts of Manitoba which contained a number of past gold producers, continued to be the prime focus of exploration interest in 1987.

In the Flin Flon-Snow Lake Belt, Granges Exploration Limited's Tartan Lake and Pioneer Metals Corporation's Puffy Lake deposits began production in 1987, and were operating at capacity by the end of the fiscal year.

An announcement by Snow Lake Mines Ltd. respecting its property north of the Snow Lake townsite indicated mineralized reserves in two zones and good values in a third. In the second half of 1987 a pre-feasibility study established metallurgical and capital cost parameters.

Also in Snow Lake, High River Resources Ltd. dewatered the former Nor-Acme Mine to approximately the 210 metre level by the end of the year. Additional surface work was conducted on the nearby "Boundary" and "Toots" zones.

Mingold Resources Inc. (Hudson Bay Exploration's gold affiliate) began development on the Hudvam base metal property at Vamp Lake to explore its relatively high gold values. An all-weather road was completed, surface drilling will be undertaken and a 1 525 metre decline to the ore zones was planned.

Other companies active for gold in this belt were Noranda Exploration, Esso Resources Canada Limited, Homestake Mineral Development (HMD) Company, and Falconbridge Limited. Junior companies included Varna Gold Inc., Westfield Minerals Limited, Nor-Acme Gold Mines Limited, Zenco Resources Inc., W. Bruce Dunlop Limited, Ray-Dor Resources Ltd. and several independent prospectors.

In the Lynn Lake Belt Sherritt Gordon Mines Limited-SherrGold Inc., Manitoba Mineral Resources Ltd., Balcor Resources Corp., Granges Exploration Ltd. and Esso Resources Canada Limited conducted extensive programs of prospecting, mapping, geochemical sampling, geophysics and diamond drilling throughout the belt. The number of reported gold exploration projects was up by 60 percent to 40.

SherrGold Inc. mounted a large exploration program in 1987 in the Lynn Lake area which included: an exploration ramp on the "Nisku" occurrence east of the MacLellan Mine; increasing ore reserves in the "Main Zone" at MacLellan; and drilling "Rainbow" and "Dot" zones west of the mine. Nisku and Rainbow are to be brought into production in 1988. Additional exploration was carried out on SherrGold's properties in the rest of the belt.

On the Farley Lake discovery, 40 kilometres east of Lynn Lake, Manitoba Mineral Resources and Mingold Resources Inc. planned to do fill-in drilling between the two mineralized zones. A pre-feasibility study on a proposed open pit was completed and a production decision was scheduled for 1988.

During 1987, the gold potential of the Central Eastern Greenstone Belts attracted a number of companies including Westmin Resources Limited, Tanqueray Resources Ltd., Noranda Exploration, Canadian Nickel Company Limited, BP Resources Canada Limited, International Platinum Corporation, Varna Gold Inc., Bighorn Development Corporation, Lithium Corporation of Canada Limited, Rio Algom Exploration Inc. and a number of junior companies and prospectors.

At their Utik Lake property, Westmin Resources with partners Polestar Exploration Inc. and Barringer Magenta Limited reported encouraging gold value intersections. Additional drilling to test other gold showings on the property is planned.

In the Island Lake area, Bighorn Development Corporation continued rehabilitating the old Ministik gold mine located on High Rock Island and construction of a 25 tonne per day pilot mill was in progress. South of the mine additional drilling was done on extensions of the "Main" vein.

In the Seal River area, west of Churchill, Falconbridge Limited and Continental Gold Corporation commenced gold exploration projects including airborne and ground geophysical programs with follow-up drilling.

The Rice Lake Belt and surrounding areas of southeastern Manitoba were quite active for gold exploration, with many companies and prospectors participating.

Goldbeam Resources Ltd. announced a program to increase reserves at their mine at West Hawk Lake. An open pit, tank leaching operation is proposed if larger reserves can be proven. Ausgold Recovery Systems Ltd. performed a heap leach reclamation of the old Diana Mine tailings in the Bissett area.

Inco Limited completed an extensive underground drilling and sampling program at the San Antonio mine which did not substantially increase gold reserves and they opted to transfer its interests back to Cassiar Mining Corporation.

Other companies involved in geological, geophysical and diamond drilling programs in the area included Esso Resources Canada Limited, Mid-North Resources Limited, International Platinum Corporation, Pronto Explorations Limited, Falconbridge Limited, Noranda Exploration, Manitoba Mineral Resources Ltd., Canadian Nickel Company Limited, Westley Mines Limited, Mutual Resources Ltd., Abermin Corporation, Kangeld Resources Ltd., Tulsa Resources Limited, Canhorn Mining Corporation, Granges Exploration Ltd., Almaden Resources Corporation, Polestar Exploration Inc. and other junior companies and local prospectors.

In other mineral commodities, Tantalum Mining Corporation of Canada Limited announced it will resume production of tantalum concentrates in 1988 at its Bernic Lake facility in southeastern Manitoba. The mine and mill will be refurbished at a cost of several million dollars.

Petroleum Division

The Petroleum Division administers provisions under The Mines Act, The Pipe Line Act and The Gas Storage and Allocation Act relating to exploration, development, production and transportation of crude oil and natural gas. The division also assists the Department of Finance in administering The Oil and Gas Production Tax Act.

One major function of the Division is to develop, recommend, and administer policies and legislation to encourage exploration and development of the province's crude oil and natural gas resources in an orderly, safe and efficient manner. It also conducts studies and provides technical assistance to The Oil and Natural Gas Conservation Board on matters relating to salt water disposal, enhanced recovery projects, unitization agreements and other board responsibilities.

Collection and analysis of petroleum industry statistics, as well as the monitoring of federal-provincial policies, enable the Division to evaluate the effects of these policies on the province's petroleum industry. See Tables 7 -12 for statistical and financial summaries.

Several reports are produced each year providing the public, industry and government with information on the petroleum industry in Manitoba. The Division is comprised of three Sections: Administration, Geology, and Engineering and Inspection. Each Section has specific responsibilities within the overall function of the Division.

Administration

The Administration Section administers regulations under The Mines Act governing the disposition of Crown oil and natural gas rights and the collection of Crown oil and natural gas royalties. These responsibilities include conducting Crown lease and exploration reservation sales; collecting annual rentals; processing renewal and extension applications; and enforcing other provisions under the Petroleum Crown Leasing Regulation and the Petroleum Crown Royalty and Incentives Regulation.

The Section also administers the Manitoba Drilling Incentive Program and the Enhanced Oil Recovery Incentive Program, and collects and publishes monthly production and disposal/injection data on all active wells in the province.

The Section assists the Department of Finance in the collection of taxes from producing freehold mineral rights under The Oil and Gas Production Tax Act.

In addition to internal administrative functions, the Section handles all financial functions of the division, including the collection of registration, license and subscription fees and technical service charges.

Geology

The Geology Section evaluates geological data and provides consultation to the petroleum industry and the public. It is responsible for the administration of the Petroleum Geophysical Regulation and assists The Oil and Natural Gas Conservation Board in the designation of field and pool boundaries.

The Section also prepares reports on Manitoba's petroleum geology and hydrocarbon potential to encourage and assist in the exploration and development of the province's petroleum resource.

Engineering and Inspection

The Engineering component, located in Winnipeg, administers regulations under The Mines Act relating to petroleum exploration, drilling and production operations (Petroleum Drilling and Production Regulation). This includes processing drilling license applications as well as applications to recomplete, suspend or abandon wells. Technical support is provided to The Oil and Natural Gas Conservation Board in processing applications relating to well spacing, off-target drilling, production allowables, salt water disposal, pressure maintenance, gas conservation and unitization.

Through its technical studies of oil and gas reserves, enhanced recovery potential and the hydrocarbon potential of Manitoba, the Engineering component offers consultation services and information to the petroleum industry and the public.

Administration of The Pipe Line Act and The Gas Storage and Allocation Act are also the responsibility of the Engineering component. The component encourages the recovery of Manitoba's petroleum resources while minimizing environmental impact.

The Inspection component of the Section, with district offices in Virden and Waskada, enforces regulations under The Mines Act relating to geophysical, drilling, production and pipe line operations. Staff license and inspect field facilities, investigate complaints, witness specific operations, and interpret and communicate departmental or regulatory requirements to industry personnel.

The Inspection component also administers a program which requires ongoing reclamation of all oil or salt water spill sites.

The Petroleum Industry

Crown Oil and Natural Gas Lease Sales

In 1987, the Division held two sales of Crown oil and natural gas leases. These leases entitle the holder to explore for and produce crude oil and natural gas from Crown-owned mineral rights.

A total of 57 leases covering 5 813 hectares were sold for a total of $594,635.

In the April 8, 1987 sale, all 22 leases offered, covering 2 016 hectares, were sold for a total of $232,744. The average price per hectare in this sale was $112.40, an increase of 102 per cent compared with the October 22, 1986 land sale average of $55.77 per hectare.

The highest price per hectare was paid for a half section lease in the Scarth area south of Virden. A tender bonus of $29,470, or $230.23 per hectare, was paid for this parcel.

The second sale was held on October 14, 1987 and generated $361,891. Thirty-five of the 48 leases offered, covering 3 797 hectares, were sold with an average price per hectare of $92.35.

A parcel west of Oak Lake generated the highest per hectare price ($202.48) as a tender bonus.

No exploration reservations were offered in 1987.

Since the resumption of Crown oil and gas lease sales in 1979 the province has generated revenue valued at $14,819,721 from the disposition of Crown oil and natural gas leases and exploration reservations.

Crown Oil and Natural Gas Leases

As of December 31, 1987, 62 480 hectares of Crown oil and natural gas rights were under disposition. Crown leases accounted for 61 712 hectares (99 per cent) while exploration reservations amounted to 768 hectares (1 per cent). Compared with 1986, the total area under disposition decreased by 6.5 per cent.

Effective January 1, 1983, non-productive areas and rights below the producing formation in Crown leases revert to the Crown when the lease expires. From January 1, 1983 to December 31, 1987, these regulations resulted in 295 leases, covering 39 802 hectares, being terminated. The cancelled rights become available for leasing by other parties interested in developing them.

Leases may be extended for an additional year if a rental penalty is paid and a commitment to a drilling program is made. In 1987, one lease was extended.

Geophysical Activity

Geophysical activity in 1987 increased sharply from 1986. Thirteen geophysical licenses were issued covering approximately 1 000 kilometres. The cost of these programs is estimated at $2.5 million.

In 1987, geophysical programs were carried out in the following areas of the province: South McAuley, Elkhorn, Cromer, Pilot Mound, Pierson, Birdtail, Cosgrove, South Pierson, Oak Lake, Virden, Napinka, Broomhill, Lauder, Hartney, Reston, Pipestone, Daly, Russell, Shellmouth and Tilston.

Table 10 indicates those programs licensed in 1987 by licensee and geophysical operator.

Drilling Activity

Drilling activity was down for the second consecutive year due to the collapse and slow recovery of crude oil prices during 1986 and 1987. With 116 drilling licenses issued, 17 different oil companies drilled 107 wells, 21 per cent fewer than in 1986. Six drilling contractors using 11 drill rigs drilled 96 970 metres of hole. Of the 107 wells drilled, 74 were classified as development wells, while the remaining 33 were exploratory.

The success rate for wells drilled continues to be high, with 84 per cent (90 wells) being completed as potential oil wells.

Ninety-three and 64 per cent success rates were achieved for the 74 development and 33 exploratory wells drilled in 1987.

The Daly area continued to draw most of the drilling activity (40 per cent) with 27 development wells and 16 exploratory wells. The Waskada area recorded 29 wells (23 per cent of total drilling activity), while the South Pierson area accounted for 8 wells drilled.

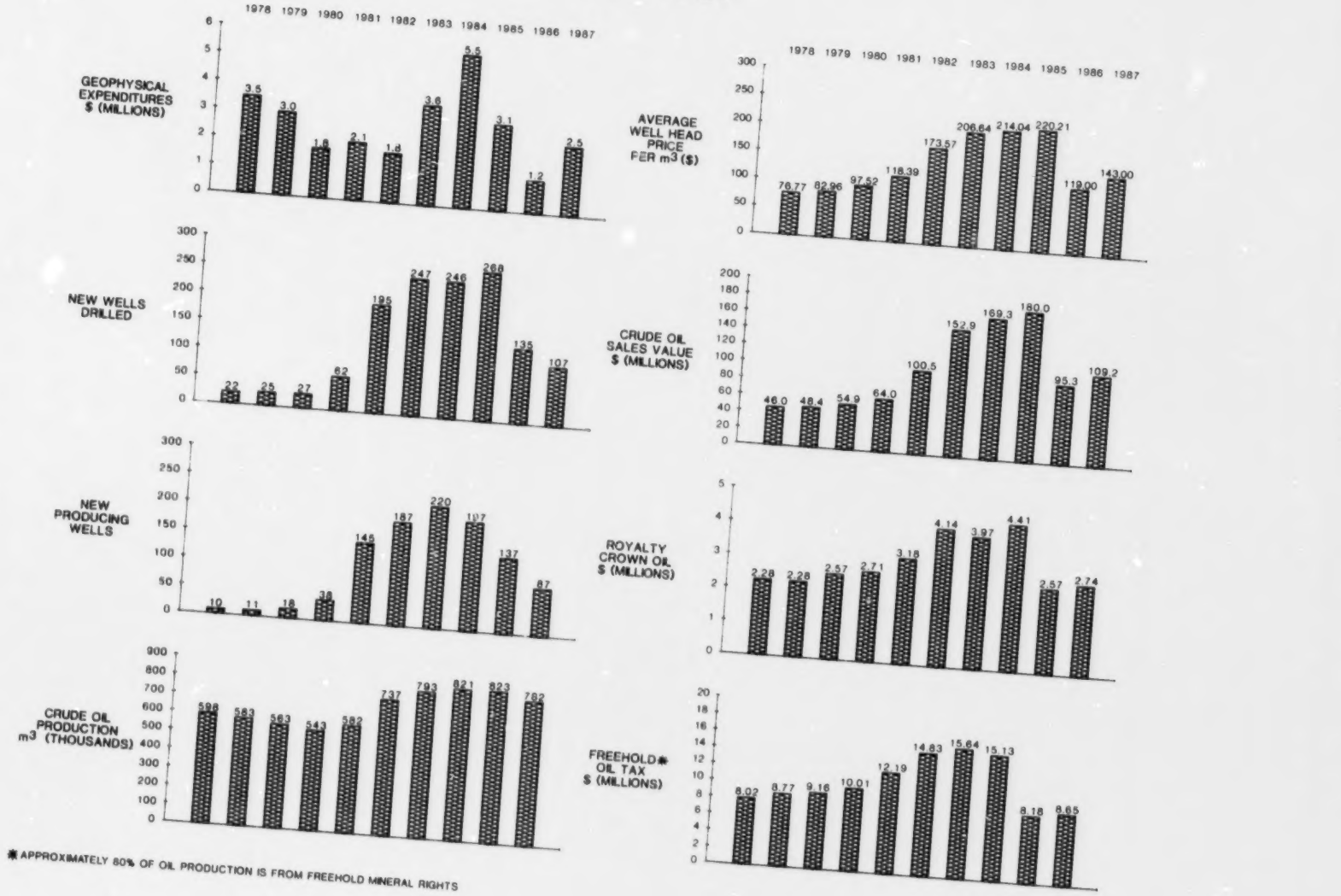
Areas of New Interest

Daly Field (Bakken Play)

At present this play is concentrated in the northwestern part of the Daly Field. The play began in 1985 with the completion of a well located at 13-21-10-29. Currently, there are 22 wells in the Daly Field producing from the Bakken Formation. Bakken oil is of very high quality, light with low sulphur content.

Development of Bakken potential has provided a second exploration objective, helping to stimulate development of the overlying Lodgepole Formation.

Figure 5
Performance of the Petroleum Sector 1978 - 1987



*APPROXIMATELY 80% OF OIL PRODUCTION IS FROM FREEHOLD MINERAL RIGHTS

South Pierson

Since 1985, a significant development occurred in the extreme southwest corner of the province in the South Pierson Field. Substantial reserves have been discovered in the Lower Amaranth Formation (equivalent to the main producing Formation at Waskada). Delineation and development of the pool is continuing.

Regent

Development of a Mississippian Lodgepole pool north of Whitewater Lake has resulted in the designation of a new field, "Regent," in 1987. Six new producing wells were completed in the pool. The pool lies at or near the Lodgepole subcrop edge and is similar to established pools to the north and south. Development is continuing.

Production and Markets

Manitoba's annual crude oil production decreased for the first time since 1981. Production dropped to 781 806 m^3 in 1987, a 5 per cent decrease from 1986.

The province had 1,434 oil wells producing in December 1987, a 5 per cent increase from December 1986.

Oil production from the Virden, Waskada and Daly Fields accounted for 41 per cent, 28 per cent and 20 per cent respectively of Manitoba's total production.

The largest increase in oil production was in the South Pierson Field where an 89 per cent increase resulted in 5 749 m^3 being produced.

New Oil production (oil produced from wells drilled since 1973) accounted for approximately 51 per cent of total production, or 400 000 m^3.

Of the total amount of Manitoba oil purchased by refiners in 1987, approximately 38 per cent was refined in Ontario, 12 per cent in Quebec, and 50 per cent went to refineries in the United States.

Oil Prices

Following the collapse in world oil prices early in 1986, oil prices continued to steadily recover until August 1987. Since then, prices have declined steadily.

In January 1987, the average price of crude oil produced in Manitoba was \$140.77/m^3 (\$22.37 Cdn. per barrel). Prices increased to a high of \$157.00/m^3 (\$24.95 Cdn. per barrel) in July and August and then steadily fell, closing out the year at an average low of 131.00/m^3 in (\$20.82 Cdn. per barrel).

Compared with the 1986 average of \$119.00/m^3 (\$18.90 Cdn. per barrel), Manitoba's overall average crude oil price increased in 1987 by 20 per cent to \$143.00/m^3 (\$22.70 Cdn. per barrel).

Value of Production

Despite a decline in crude oil production, higher crude oil prices supported an overall increase in the value of crude oil production. The total value of oil production reached \$109.2 million, up 14 per cent over 1986.

Revenue to Freehold Surface and Mineral Owners

Surface Owners

Companies wishing to explore or develop oil and gas rights in Manitoba must negotiate a right-of-entry with the individual landowner. In return for this right-of-entry, the landonwer receives a negotiated cash settlement.

Prior to drilling a well, an oil company is required to negotiate a surface lease with the landowners. The normal surface lease includes a first-year bonus payment and a subsequent annual rental fee for the duration of the lease.

Where the landowner is renting his land to another party, the oil company seeking right-of-entry must obtain the consent of both the landowner and the occupant. After a lease has been signed, the landowner and occupant then determine what each will receive as his share of the compensation paid by the oil company.

In 1987, an estimated \$4.0 million was paid by oil companies to landowners in the form of first-year bonuses (\$0.7 million) and annual rental fees (\$3.3 million).

Following proclamation of The Surface Rights Act on August 9, 1984, disputes relating to right-of-entry are referred to the Surface Rights Board. The board's principal function is to arbitrate disputes between the petroleum industry and landowners regarding use of land for exploration, development and related operations, and to determine the compensation to the landowner.

The Minister of Municipal Affairs is responsible for The Surface Rights Act. The Surface Rights Board administers the Act and has an office in Winnipeg.

Freehold Mineral Owner's Leasing and Revenue

Approximately 80 per cent of the mineral rights in southwestern Manitoba are privately owned (freehold). There is keen competition among companies to negotiate new leases with freehold mineral owners in areas of current interest. Freehold mineral owners receive revenue from signing bonuses, delay rental payments and oil royalties from production. Freehold royalties may range from 12 1/2 to 20 per cent of

gross production sales value. Gross royalties payable to freehold mineral owners, before payment of federal and provincial taxes, were estimated in 1987 at $11.9 million (not including signing bonuses and delay rental payments for new and non-producing leases).

Provincial Revenue from Oil Production

Although production declined and lease sale revenues were down from 1986, the increase in crude oil prices maintained direct government revenues in 1987. During 1987, the Manitoba government collected approximately $12.3 million in revenues ($2.7 million in Crown oil royalties, $8.7 million in freehold oil taxes and $0.9 million in Crown lease sale bonuses, rentals and fees), a 3 per cent increase over 1986. These figures do not include provincial revenues in the form of corporate capital tax, sales tax, municipal tax and corporate and individual income tax.

Municipal Tax Assessments

Oil producers in Manitoba are subject to a municipal tax on wells and associated production facilities, including: oil wells, batteries, salt water disposal wells, salt water disposal plants, water injection wells, suspended wells and pipelines.

The municipal tax assessment on these facilities for the calendar year 1987 was approximately $8.8 million, a decrease of 2 per cent over the previous year. Actual tax revenue from these assessments should amount to approximately $1.8 million for affected municipalities.

Waskada Gas Plant

During 1987 the Waskada gas plant, now in its fourth year of production, operated at 26 per cent of capacity (capacity - 85 000 m^3 natural gas/day). Compared with 1986, volumes in 1987 decreased by 19 per cent. Of the total 4 419.0 m^3 of natural gas liquids produced, propane accounted for 67 per cent, butane 25 per cent and condensate 8 per cent for a total value of $324,612.00.

As of December 31, 1987, the majority of the dry processed gas from the plant was being injected for storage into underground formations.

Manitoba Drilling Incentive Program (1979 - 1986)

The original "Manitoba Drilling Incentive Program" provided for reduced Crown oil royalty and freehold oil tax rates on oil produced from new wells. Wells drilled between January 1, 1979 and January 1, 1987, and producing from Crown mineral rights, qualified for a special reduced royalty rate charged on "old oil." New wells producing from freehold mineral rights were eligible for a corresponding incentive freehold oil tax rate under The Oil and Natural Gas Tax Act.

The reduced royalty and tax rates applied to production from a new oil well during its "incentive period."

The incentive period earned for wells producing from provincial Crown mineral rights was called a "royalty incentive period" (RIP), whereas wells producing from freehold mineral rights earned a "production incentive period" (PIP).

As of December 31, 1987, 206 of the 1,624 wells capable of producing oil in the province were operating under an incentive period (21 per cent under RIP and 79 per cent under PIP).

The Manitoba Drilling Incentive program was instrumental in attracting oil companies to Manitoba over the past eight years. During that period 1,205 wells were drilled.

Since the program was implemented in 1979, the estimated value of the incentive to industry has been in excess of $15 million.

The original Drilling Incentive Program expired on December 31, 1986.

Manitoba Drilling Incentive Program (1987 - 1991)

The "new" Manitoba Drilling Incentive Program announced March 2, 1987 (effective January 1, 1987) replaces the previous program which expired on December 31, 1986. The new program provides greater incentives for drilling exploratory wells while also assisting development drilling.

Under the new program, qualifying new wells are provided with a royalty/tax free "holiday volume." The amount of "holiday volume" varies in response to oil prices and is dependent on the well's location, depth, producing formation and qualifying credits from previous dry holes. This represents a significant improvement over the previous program, which provided operators with reduced royalty/tax rates for a period of time dependent only on well depth.

Each new oil well drilled in Manitoba after January 1, 1987, and prior to January 1, 1992, can earn a "holiday volume" of oil up to a maximum of 10 000 m^3 or 5 years of production, whichever occurs first.

The program has been generally successful despite the collapse of crude oil prices. Total royalty and tax savings to operators during the first year of the program (1987) amounted to approximately $400,000.

The province managed to maintain drilling activity in 1987 at a respectable level of 107 wells.

Enhanced Oil Recovery Incentive Program

The new Enhanced Oil Recovery Incentive Program (also announced March 2, 1987) is designed to maximize oil recovery by encouraging enhanced oil recovery (EOR) projects.

Under this program, the first of its kind in Manitoba, wells in new or enlarged enhanced oil recovery projects approved after January 1, 1987, and fully implemented prior to January 1, 1992, are eligible for an incentive period of up to 60 months. During this time, operators benefit from reduced Crown royalty and tax rates on production from the projects.

During 1987, two of the three waterflood projects implemented qualified under the EOR incentive program.

Oil Reserves

From 1973 to 1980, remaining established oil reserves in Manitoba declined at a rate of approximately 5 per cent per year due to production and lack of new discoveries.

This trend began to reverse in the early 1980s with new discoveries in the Kirkella area and with the major new discovery of the Amaranth pool in the Waskada area. As a result of additional development in these areas in 1982 and 1983, reserves increased. This increase in the province's remaining established reserves followed more than 16 years of decline.

As of December 31, 1987, the province's total remaining established crude oil reserves were 8.07 million m^3 (51 million barrels), a decrease from the 1986 total of 8.45 million m^3 (53 million barrels). The decrease can be attributed mainly to production and the drop in drilling activity as a result of the crude oil price collapse and reduced company cash flow.

Petroleum Industry Employment

In 1987, direct industry employment decreased slightly to 305 person years, a 2 per cent decrease from 1986 levels. Of this total, approximately 65 person years were attributed to new geophysical and drilling activity, while the remaining 240 person years were associated with ongoing operation and maintenance funtions of existing petroleum related facilities.

In addition to direct employment there are indirect jobs created as a result of petroleum industry activity. For every 10 direct jobs created by the petroleum industry in 1987, there were 10 to 15 indirect jobs created — resulting in another 300 to 450 person years of indirect employment.

Industry Expenditures

In 1987, as a result of the downturn in oil patch activity, it is estimated that industry spent $82 million in Manitoba, compared with $86 million in 1986.

Total expenditures can be broken down into seven categories: exploration, development, land, producing facilities, production costs, royalties and other.

The exploration component, which includes exploratory drilling costs, geophysical and geological work, amounted to approximately $9.1 million.

Development costs, which include development drilling, accounted for approximately $12.9 million.

Land costs amounted to $3.9 million, based on freehold and Crown mineral and surface rights acquisition costs, fees and rentals.

Producing facilities accounted for approximately $5.7 million and included mainly capital costs associated with field equipment and enhanced recovery schemes.

Production costs were valued at $26.1 million and include well operating, flow line and gas plant costs.

Royalties, estimated at $21.8 million for 1987, included freehold production royalties, Crown production royalties and freehold oil taxes.

Other costs in total industry expenditure include municipal taxes, right-of-way acquisitions and miscellaneous expenditures totalling approximately $2.3 million.

Oil and Natural Gas Conservation Board

The Oil and Natural Gas Conservation Board is established under provisions of The Mines Act with powers to inquire into all matters relating to the drilling, production, transportation and distribution of oil and natrual gas in Manitoba. The Board conducts hearings and may make orders as specified under The Mines Act.

Board Hearings

No hearings were conducted by the Board in 1987.

Board Orders

The Board processed a number of applications and issued the following Board Orders:

Oil and Natural Gas Conservation Board

Oil and Natural Gas Conservation Board Orders Issued — 1987

Board Order Type	Board Order Number	Field/ Pool/Well
Field Order:	F5-87	All Fields
Pool Order:	P6-87	All Pools
Maximum Permissible Production Rate Order:		
	76A	Waskada Field Unit No. 16
	77A	Waskada Field Unit Nos. 7, 13, 15
	78A	Waskada Field Unit Nos. 9, 10, 12
Pressure Maintenance Order:		
	PM-53	Daly Lodgepole A Pool
	PM-54	Waskada Lower Amaranth A Pool
	PM-55	Virden Lodgepole B Pool
	PM-56	Daly Lodgepole A Pool
	PM-57	Waskada Lower Amaranth A Pool
Drilling Spacing Unit Order:		
	SU-3	Daly Lodgepole A Pool
Salt Water Disposal Order:		
	28 SWD	Rideau Daly SWD 14-15-9-29 (WPM)
	29 SWD	Rideau Pipestone Kirkella SWD 8-19-12-29 (WPM)
	30 SWD	Home Scurry Pierson SWD 6-4-2-29 (WPM)
	31 SWD	Tundra Regent Prov. SWD 8-11-4-22 (WPM)
Conservation Unitization Order:		
	No. 32	Waskada Unit No. 6

Policy, Planning and Project Development Division

Energy Policy

The Energy Policy Branch provides research, policy advice, program development and evaluation on all energy forms to the department's executive and Energy Management Division. It also advises the Government on energy issues with implications for the province.

Energy Policy recommends energy development strategies for policy consideration and undertakes supporting economic analysis and evaluation of alternative options. In this regard, it maintains comprehensive information on current and future energy markets both within and outside the province.

The branch is responsible for evaluating the effects of the national natural gas deregulation process on Manitoba. In this matter, the department attended the Public Utilities Board hearings on the gas distribution companies' applications for new rates effective January 1, 1988.

The branch assesses specific energy related projects. Economic and financial analysis of petroleum products pricing, hydro-electric development, energy exports, energy conservation projects and energy-intensive industries was undertaken during the fiscal year. Work was done in support of the Manitoba Energy Authority and the Interdepartmental Committee on Gasoline Marketing.

The Energy Policy Branch intervenes in the hearings of extra-provincial regulatory and advisory bodies such as the National Energy Board as required.

Energy consumption in the province in the years 1985 to 1987 is shown in tables 14 and 15.

Natural Gas

Energy Policy staff aided in advancing natural gas policies directed toward lowering natural gas prices for Manitobans. Staff activities included analytical support for Manitoba Oil and Gas Corporation endeavours to obtain transportation for competitively priced direct purchase natural gas, negotiations to purchase distribution facilities of Inter-City Gas (ICG) in Manitoba, and department executive participation in pricing negotiations between ICG and TransCanada Pipelines (TCPL) for the 1987/88 heating season.

In May 1987, MOGC applied to the National Energy Board (NEB) to order TCPL to transport direct purchase gas for MOGC. The NEB held hearings in September 1987 and issued its decision denying pipeline access to MOGC in October on the grounds the application constituted self-displacement. MOGC made an application to the federal court for leave to appeal the NEB decision.

In June of 1987 negotiations to purchase ICG's Manitoba assets were entered into. These negotiations were not succesful and were halted in December 1987.

Departmental executives were involved in ICG and TCPL negotiation of natural gas pricing for the 1987/88 heating season which resulted in a substantial reduction over 1986/87 pricing.

Special Projects

The Special Projects section provides research and analysis for projects identified by senior management. During the past fiscal year the section assisted in developing new energy conservation policy and program initiatives. It also continued planning and developing energy end-use forecasting through computer modelling, and investigated strategies involving demand-side and supply-side options in the natural gas and electricity sectors.

Mineral Policy

The Mineral Policy Branch analyses and evaluates the economic impact of provincial, national and international mineral developments on the provincial mineral industry, and assists in relevant policy development and implementation. Studies by the branch contribute to effective management of Manitoba's mineral resources.

The branch also collects and analyses provincial mining statistics. This is done both by direct provincial surveys of mine and mill production, and through agreements with the Department of Energy, Mines and Resources Canada and Statistics Canada, to survey Manitoba mining and exploration companies on behalf of these agencies. The branch conducts a survey, every December, of exploration companies active in the province to provide an estimate of exploration expenditures in the current year and a forecast for the following year.

The branch is responsible for the Province's activities under Sector C, Development and Marketing Studies, of the Canada/Manitoba Mineral Development Agreement. Studies have focused on the viability of Manitoba's copper-zinc sector and development opportunities for the province's industrial minerals.

Staff undertook and participated in a number of studies pertaining to Manitoba's mineral industry. Activities included providing analytical support for the maintenance of production and employment at the Ruttan Mine near Leaf Rapids; studies related to modernizing the Flin Flon copper/zinc processing facilities; a comprehensive review of mineral revenue sources; and participating in implementation of the new Environment Act.

Manitoba Potash Project

Significant progress was made toward developing a world-scale potash mine in the Russell-Binscarth area of southwestern Manitoba. The deposit delineated in this area is one of the best undeveloped potash properties in the world.

The Mineral Policy Branch played an active role in marketing and consortium development activities and participated in a full-scale technical and economic evaluation of the Manitoba Potash Project, completed in August 1987. This study confirmed the engineering feasibility and economic viability of mining and processing 2 million tonnes of potash per year. Based on these results, Manitoba and Canamax Resources Inc. are cooperating to bring the Manitoba Potash Project to a stage where a final production decision can be made. As the joint venture partner responsible for marketing and consortium development, Manitoba held discussions with a number of potential participants in North America and offshore. Potash markets improved considerably during 1987/88, and prospects for development of the Manitoba Potash Project are excellent.

Financial and Administrative Services Division

The Financial and Administrative Services Division provides a range of support services to the entire Department. These services are mainly in areas of finance, personnel, operations, and information systems. The Division is also responsible for administrative policy development.

Financial Services

Financial Services provides financial, accounting and budgetary services to the Department. These include:

- financial planning and co-ordination of the estimates process;
- financial advice to program directors and managers;
- expenditure control;
- financial reporting;
- voucher processing;
- disbursement accounting;
- revenue accounting; and
- co-ordination of authority-seeking document submissions.

The major accomplishments in the past year include the computerization of the accountable advance recording system, salary projections and budget distribution forms in order to improve the timeliness of financial information; development of an Authority Seeking Documents Manual which provides direction to branches in preparing submissions in a systematic and consistent manner; development of a Commitment Accounting/Financial Reporting System in order to provide timely financial information for executive management; and revision of accounts processing procedures resulting in a more timely payment of accounts and fewer departmental errors.

Personnel and Operations

Personnel and Operations provides centralized human resource and operational support services to the department. These services include:

- position classification;
- recruitment and selection;
- employee relations;
- training and development;
- organizational analysis;
- payroll and benefits administration;
- affirmative action co-ordination;
- performance management;
- co-ordination of requests for departmental goods and services, including fleet vehicles, office equipment and office accommodations;
- records management; and
- French Language Services co-ordination.

In 1987/88, 44 positions were staffed (excluding summer students) and reviews were completed on 17 positions resulting in 13 reclassifications. Major accomplishments during the year include the implementation of three new policies and related systems on performance management; training and development; and overtime. In order to provide managers with improved personnel-related information, quarterly and annual reports on sick leave utilization, overtime and performance management were introduced.

Major affirmative action activities for the year included presentation of a one day workshop to 65 employees in four separate sessions and the introduction of the requirement for annual divisional plans commencing in 1988/89. Considerable work was also done in the scheduling of departmental records in preparation for proclamation of the Freedom of Information Act.

Information Systems

Information Systems provides the department with data processing, word processing and library support services. The services provided include:

- equipment evaluation, acquisition and user education;
- computer systems design and implementation;
- liaison between department and other government agencies;
- maintenance and backup to the main word processing equipment;
- assistance to divisions with word processing needs;
- purchasing services for journals and books;
- cataloguing of books and government documents; and
- reference and inter-library loans to department employees, industry and education institutions.

The major accomplishments of the past year include the purchase of a sophisticated mapping system for the Mining Recording Section, which will increase the speed and accuracy of claim maps production, and the development of a number of small systems resulting in increased output, and more accurate and timely departmental information.

Communications and Community Relations Division

The role of the Communications and Community Relations Division includes:

- to inform the public of the department's activities;
- to assist other branches and divisions in their communications tasks;
- to provide communications services to government agencies reporting to the Minister of Energy and Mines;
- to inform all departmental staff of departmental activities and policies through internal communication; and
- to advise Executive Management Committee on communications issues.

In its public information role, the Division maintains the Energy and Mines Info Centre in Eaton Place. The centre stocks a wide selection of provincial and federal publications, and publications of Manitoba Hydro. These publications deal with:

- energy management techniques for homes, businesses, community organizations, and institutions;
- Manitoba's energy resources, including hydroelectricity, oil, and natural gas;
- government energy conservation programs; and
- Manitoba's mineral resources and industries.

The Info Centre answers public inquiries received by mail, telephone, and in person. Between April 1, 1987 and March 31, 1988, the staff responded to 20,987 inquiries. The centre staffed displays throughout Manitoba — visiting shopping malls, rural fairs and trade shows. Overall, the centre distributed 94,286 publications.

In fiscal year 1987/88, Communications and Community Relations continued to operate the Infobus (mobile Info Centre). The Infobus visited 47 communities throughout the province.

Community Relations staff made presentations at 12 public schools in connection with the printed Mineral Education Series.

Other activties of the Division included media relations, arrangement of news releases, speeches, slide-tape presentations, feature articles, public service announcements, displays, posters, brochures and booklets, radio advertisements, print advertisements, and various newsletters.

Statistical Supplement 1987/88

Table 1

Energy and Mines Expenditure Summary

Year Ending March 31, 1988

	(000's) Actual	Estimate	Variance Inc (Dec)	Explanation Number
Administration and Finance				
Minister's Salary	20.6	20.6	0.0	
Executive Support	368.8	380.2	(11.4)	
Communications	204.1	193.4	10.7	
Financial & Admin. Serv.	618.1	626.3	(8.2)	
TOTAL	1,211.6	1,220.5	(8.9)	
Energy Management				
Policy, Planning & Project Development	1,865.0	1,150.6	714.4	1
Prov. Energy Programs	751.6	781.8	(30.2)	
Prov. Audit Programs	445.0	513.3	(68.3)	
Cut Home Energy Costs (CHEC)	1,665.3	1,728.9	(63.6)	
Manitoba Energy Council	0.5	35.0	(34.5)	
TOTAL	4,727.4	4,209.6	517.8	
Mineral Resources				
Administration	100.1	101.7	(1.6)	
Petroleum	793.7	793.7	0.0	
Mines	1,675.2	1,728.5	(53.3)	
Geological Services	2,134.3	2,151.3	(17.0)	
Canada/Manitoba Mineral Develop. Agreement	1,859.7	2,147.1	(287.4)	2
TOTAL	6,563.0	6,922.3	(359.3)	
Expenditures Related to Capital Assets				
Capital Grants	0.0	50.0	(50.0)	
TOTAL DEPARTMENT	12,502.0	12,402.4	99.6	

Explanation of Major Variances

1. Major increase attributable to costs for legal and consulting services associated with natural gas activities.
2. Major under-expenditure due to contracts/projects not delivered and/or being deferred to a later date.

Table 1 (Cont'd)

Energy and Mines Revenue Summary

Year Ending March 31, 1988

	(000's) Actual	Estimate	Variance Inc (Dec)	Explanation Number
Minerals	1,768.4	1,723.4	45.0	
Petroleum	3,562.0	3,350.3	211.7	
Sundry Revenue	80.3	129.5	(49.2)	
TOTAL	5,410.7	5,203.2	207.5	
Government of Canada	2,550.0	2,600.0	(50.0)	
TOTAL FOR DEPARTMENT	7,960.7	7,803.2	157.5	

Table 2

Revenue from Mining and Quarrying

Year Ending March 31, 1988

	(000's) 1986/87	(000's) 1987/88
Disposition, Fees, Rentals, Etc.	1,017.6	1,110.2
Mining Claim Lease Tax	75.0	75.0
Royalties (from Industrial Mineral Production)	576.3	658.2
The Mining Tax Act	48,106.2	29,172.2*
TOTAL	49,775.1	31,015.6

**The amount of $29,172.0 represented the gross revenue collected; $875.2 was transferred to the Mining Community Reserve Fund (OIC 446/88).*

Table 3

Mineral Dispositions in Good Standing

at calendar year end 1984 to 1987

	1984		1985		1986		1987	
Mining	**No.**	**Hectares**	**No.**	**Hectares**	**No.**	**Hectares**	**No.**	**Hectares**
Mining Claims	6,029	715 303	5,887	702 754	6,629	872 551	6,965	963 697
Order-in-Council Leases	4,184	119 382	4,184	119 382	4,184	119 382	4,184	119 382
Permits	11	351 006	8	279 456	15	401 282	24	395 357
Explored Area Leases	38	14 338*	37	14 050	37	14 007*	37	14 008
Production Leases	25	12 612	25	12 612	25	12 612	25	12 612
Miscellaneous Mineral Leases	1	403	1	403	1	403	1	403
Special Permit	—	—	1	190 022	—	—	—	—
Potash								
Permits	1	13 480	1	13 480	1	13 480	1	7 699
							1	5 791
Quarrying								
Leases	393	11 472	403	11 676	447	13 110	473	13 675
Exploration Permits	6	742	6	693	6	868	11	1 955
Limestone Exploration Permits	2	228	2	228	2	228	—	—
Peat								
Leases	23	3 803	24	3 951	30	4 152	36	5 030
Exploration Permits	5	1 780	4	841	3	877	2	465
TOTAL	10,718	1 244 549	10,583	1 349 548	11,380	1 452 952	11,760	1 540 074

**Area of Lease reduced*

Table 4

Mineral Dispositions Issued

each calendar year 1984 to 1987

	1984		1985		1986		1987	
Mining	**No.**	**Hectares**	**No.**	**Hectares**	**No.**	**Hectares**	**No.**	**Hectares**
Mining Claims	1,112	201 058	783	136 736	1,488	301 974	1,075	212 139
Permits	8	226 079	3	106 420	11	310 724	13	203 279
Explored Area Leases	—	—	—	—	—	—	—	—
Production Leases	—	—	—	—	—	—	—	—
Miscellaneous Mineral Leases	—	—	—	—	—	—	—	—
Special Permit	—	—	1	190 022	—	—	—	—
Quarrying								
Leases	34	1 077	23	516	50	1 629	46	1 231
Exploration Permits	—	—	1	128	7	868	5	1 533
Limestone Exploration Permits	2	228	—	—	—	—	—	—
Casual Permits	64	—	74	—	80	—	99	—
Permissions to Remove	508	—	612	—	613	—	629	—
Peat								
Leases	5	766	1	148	7	202	6	877
Exploration Permits	3	1 699	2	760	1	117	2	630

Table 5

Comparison of Manitoba Mineral Production and Value

1986 and 1987

	1986 (Jan-Dec)			1987 (Jan-Dec)*		
	Quantity (Imperial)	Value ($ 000)	Quantity (Metric)	Quantity (Imperial)	Value ($ 000)	Quantity (Metric)
Metals	(000 lb)		(000 kg)	(000 lb)		(000 kg)
Cadmium	260	453	118	254	655	115
Cobalt	628	6,300	285	866	7,432	393
Copper	144,114	133,483	65,369	158,272	172,586	71,791
Lead	1,301	402	590	1,310	628	594
Nickel	92,127	247,660	41,788	124,070	386,114	56,277
Selenium	117	904	53	128	1,080	58
Tantalum	86	3,470	39	79	2,358	36
Tellurium	11	162	5	18	231	8
Zinc	135,503	74,677	61,463	145,869	84,294	66,165
Other**	—	2,812	—	—	3,898	—
Precious Metals	(000 tr oz)		(000 g)	(000 tr oz)		(000 g)
Gold	82	41,954	2,555	121	71,431	3,753
Platinum Group	—	13,235	—	—	17,780	—
Silver	1,203	9,458	37,416	1,212	11,272	37,700
Total Metals		**534,790**			**759,759**	
Industrial Minerals	(000 ton)		(000 tonne)	(000 ton)		(000 tonne)
Cement	457	43,733	415	497	48,868	451
Clay Products	—	3,471	—	—	3,739	—
Gypsum	272	5,039	247	475	8,202	431
Lime	—	5,540	—	—	5,317	—
Peat Moss	67	9,458	61	68	10,292	62
Quartz	—	2,872	—	—	3,015	—
Sand/Gravel	14,385	35,751	13,050	14,330	36,790	13,000
Stone	4,519	26,831	4,100	4,547	28,000	4,125
Sulphur	2	387	2	3	500	3
TOTAL INDUSTRIAL MINERALS		133,082			144,723	
Fuels	(000 bbl)		(000 m^3)	(000 bbl)		(000 m^3)
Petroleum	5,179	95,337	823	4,921	110,000	782
Natural Gas By-Products	—	503	6	—	471	5
Total Fuels		95,840			110,471	
GRAND TOTAL		763,892			1,014,953	

**Estimated*

***Includes antimony, cesium, lithium*

Source: Manitoba Energy and Mines

Table 6

A Comparison of Value of Manitoba Metals, Industrial Minerals, Fuels and Total Mineral Production

From 1973-1987
(Calendar Year)

	($ 000)			
Year	Metals	Industrial Minerals	Fuels	Total
1973	363,650	38,416	17,148	419,214
1974	413,530	45,556	27,169	486,255
1975	452,236	50,662	31,451	534,349
1976	412,301	69,173	33,557	515,031
1977	446,691	81,597	40,428	568,716
1978	338,123	83,696	45,937	467,756
1979	510,049	94,279	48,403	652,731
1980	664,809	100,814	54,968	820,591
1981	478,636	115,189	64,251	658,076
1982	353,150	96,607	101,065	550,822
1983	471,077	87,360	152,892	711,329
1984	540,922	106,602	169,296	816,820
1985	571,936	109,270	180,049	861,255
1986	534,970	133,082	95,840	763,892
1987*	759,759	144,723	110,471	1,014,953

**Estimated*

Table 7

Manitoba Petroleum Statistics

(1978-1987)

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
Geophysical Licenses Issued	5	10	11	11	19	14	23	25	8	13
Geophysical Expenditures ($)	3,451,370	2,970,734	1,843,438	2,116,854	1,805,512	3,639,692	5,547,086	3,081,241	764,186	(2,500,000)
Drilling Licenses Issued	16	27	29	71	201	284	249	313	116	116
New Wells Drilled	22	25	27	62	195	247	246	268	135	107
New Wells Producing	10	11	18	38	145	187	220	197	137	87
New Wells Abandoned	6	9	9	15	30	24	30	30	11	19
Metres Drilled	18 329	20 537	23 508	61 011	184 291	229 304	220 631	231 682	118 675	96 970
Wells Capable of Production (December)	808	811	823	853	1 002	1 160	1 350	1 505	1 592	1 624
Wells Producing (December)	703	705	720	748	869	1 041	1 209	1 366	1 367	1 434
Abandoned Producers	3	4	5	5	11	13	30	14	52	28
Other Wells Abandoned	2	1	0	3	8	5	0	1	16	12
Crude Oil Production (m^3)*	598 354	583 377	563 482	542 695	582 283	736 934	793 286	820 702	823 322	781 806
Water Production (m^3)	4 075 178	3 946 337	4 171 051	4 565 210	4 581 786	5 079 609	5 575 632	5 864 460	6 215 248	6 317 251
Total Fluid Production (m^3)	4 673 532	4 529 714	4 734 533	5 107 905	5 163 997	5 816 543	6 368 916	6 685 162	7 038 570	7 099 057
% Water Cut	87	87	88	89	89	87	88	88	88	89
Avg. Oil Production (m^3 per day)	1 639	1 598	1 540	1 487	1 595	2 019	2 173	2 248	2 556	2 142
Total Oil Value ($)	45,953,383	48,403,314	54,958,340	64,054,832	100,537,270	152,349,870	169,296,154	180,049,438	95,336,905	109,202,472
Crown Oil Royalty ($ received)	2,281,355	2,280,162	2,574,515	2,714,733	3,175,625	4,135,497	3,972,225	4,412,927	2,566,956	2,740,130
Freehold Oil Tax ($ received)	8,017,968	8,768,511	9,159,426	10,005,107	12,194,350	14,825,318	15,639,045	15,132,581	7,899,154	8,642,972
Average Oil Price per m^3 ($)	76.77	82.97	97.57	118.39	173.57	206.64	214.04	220.21	114.66	143.00
Reservation Sale Bonuses ($)		40,888	820,345	611,199	—	40,192	—	—	20,285	—
Lease Sale Bonuses ($)		897,895	1,057,530	1,074,958	1,055,668	1,032,885	2,181,499	4,215,082	891,358	577,253
Reservation & Lease Rentals and Fees ($)	10,198	49,300	133,686	191,409	235,812	274,088	281,673	306,792	281,570	277,458
Crown Reservation Area (ha)*	—	4 736	16 915	22 291	20 947	14 496	1 024	1 024	768	768
Crown Lease Area (ha)	6 759	22 559	29 519	40 806	45 752	57 462	66 053	70 449	66 803	61 712
Total Crown Area Under Disposition (ha)	6 759	27 295	46 434	63 097	66 699	71 958	67 077	71 473	67 571	62 480
Industry Reported Total Expenditures ($)*	27,900,000	31,000,000	38,300,000	55,200,000	82,600,000	116,500,000	121,600,000	138,500,000	86,200,000	81,800,000

* *Source: Canadian Petroleum Association prior to 1985 (before PIP Grants and excluding income and Federal taxes); Petroleum Division estimate 1985 — 1987.*
(m^3) = cubic metres; (ha) = hectares

Table 8

1987 Summary of Crude Oil and Salt Water Production — All Fields

		Cum. Prod. Dec. 31/86 m^3	Production 1987 m^3	Cum. Prod. Dec. 31/87 m^3	Wells Produced December 1987
Daly Field	OIL	3 997 492.8	160 063.8	4 157 556.6	354
	WATER	18 177 141.5	1 314 381.3	19 491 522.8	
Tilston Field		104 141.7	6 897.7	111 039.4	15
		546 372.3	30 158.2	576 530.5	
Waskada Field		1 252 451.9	219 106.5	1 471 558.4	369
		1 833 209.0	445 269.3	2 278 478.3	
Lulu Lake Field		49 903.0	3 902.2	53 805.2	7
		189 037.0	15 614.0	204 651.0	
Virden Field		18 555 167.5	318 193.7	18 873 361.2	543
		75 250 960.0	4 144 534.3	79 395 494.3	
Whitewater Field		128 785.3	19 266.7	148 052.0	28
		178 427.5	73 044.7	251 472.2	
Pierson Field		327 471.1	21 646.3	349 117.4	46
		6 834 486.8	59 970.3	744 457.1	
Kirkella Field		224 990.7	8 573.8	233 564.5	29
		1 784 035.3	170 823.7	1 954 859.0	
Souris Hartney Field		132 790.0	2 479.6	135 269.6	7
		263 655.2	16 832.0	280 497.2	
Coulter Field		9 234.7	1 007.2	10 241.9	4
		56 236.3	8 084.2	64 320.5	
South Pierson Field		32 288.1	12 246.6	44 534.7	13
		85 641.9	21 481.5	107 123.4	
Other Areas		33 453.0	6 843.4	40 296.4	12
		193 828.7	16 271.7	210 100.4	
Undesignated Pools		—	—	—	—
		6 597.8	62.4	6 660.2	
Confidential Wells		—	1 578.5	1 578.5	7
		—	723.8	723.8	
PROVINCIAL TOTAL	OIL	24 848 169.8	781 806.0	25 629 975.8	1 434
	WATER	99 249 639.3	6 317 251.4	105 566 890.7	

m^3 = cubic metres

Table 9

Crude Oil Sales; Transporters' Deliveries

1987

Producers Disposition

Field	Production (m^3)	Sales (m^3)	Value of Sales ($)
Daly	160 722.9	160 895.1	22,321,645
Tilston	6 897.7	6 873.8	935,699
Waskada	219 109.0	219 499.0	30,801,060
Lulu Lake	3 902.2	3 865.6	525,584
Virden	318 193.7	317 774.4	44,781,313
Whitewater	19 266.7	22 630.6	2,985,194
Pierson	21 852.0	22 221.0	3,061,841
Kirkella	8 573.8	8 660.2	1,105,756
Souris Hartney	2 479.6	2 489.5	330,408
Coulter	1 007.2	1 013.5	139,047
South Pierson	12 214.0	12 462.5	1,735,873
Other Areas	7 587.2	3 015.8	479,052
Confidential	—	—	—
TOTAL	781 806.0	781 351.0	$109,202,472

Transporters' Deliveries to:

Province	Location	Company	Volume (m^3)
Ontario:	Corunna	Shell	280 111.6
	Corunna	Sunoco	813.5
	Nanticoke	Petro-Canada	502.7
	Nanticoke	Texaco	18.9
	Sarnia	Imperial	68 360.2
Quebec:	Montreal	Petro-Canada	3 377.8
	Montreal	Shell	7 501.1
	Montreal	Sunoco	—
	Montreal	Texaco	102 538.6
U.S.A.			
Illinois:	Mokena	Mobil	31 850.3
	Mokena	Petro-Canada	509.2
	Mokena	Unocal	139 707.9
Michigan:	Marysville	Sunoco	—
Minnesota:	Clearbrook	Ashland	—
	Clearbrook	Koch	126 205.8
	Clearbrook	Unocal	8 704.0
New York:	West Seneca	Canpet	98 272.3
	West Seneca	Dome	—
	West Seneca	Imperial	58 988.9
	West Seneca	Petro-Canada	567.2
	West Seneca	Shell	—

(m^3) = cubic metres

Table 10

Summary of 1987 Petroleum Geophysical Programs

Geophysical License No.	Licensee	Contractor	Km Licensed
273	Chevron Canada Resources Ltd.	Chevron Industries Inc.	315.2
274	Sceptre Resources Ltd.	Format Resources Corp.	18.0
275	Chevron Canada Resources Ltd.	Chevron Industries Inc.	52.0
276	Chevron Canada Resources Ltd.	Chevron Industries Inc.	12.3
277	Chevron Canada Resources Ltd.	Chevron Industries Inc.	16.0
278	Sceptre Resources Ltd.	Format Resources Corp.	60.4
279	Chevron Canada Resources Ltd.	Chevron Industries Inc.	167.5
280	Chevron Canada Resources Ltd.	Chevron Industries Inc.	180.5
281	Manitoba Oil and Gas Corp.	Pioneer Exploration	54.0
282	Geo-X Systems Ltd.	Geo-X Systems Ltd.	49.5
283	Manitoba Oil and Gas Corp.	Trace Exploration	48.0
284	Manitoba Oil and Gas Corp.	Trace Exploration	13.7
285	Manitoba Oil and Gas Corp.	Trace Exploration	21.3
TOTAL			1 008.0

(Km) = kilometres

Table 11

1987 Petroleum Drilling Statistics

No. of Wells Drilled by Operator:	1987	1986
Tundra Oil and Gas	22	12
Omega Hydrocarbons Ltd.	18	13
Newscope Resources Ltd.	12	16
Enron Oil Canada Ltd.	11	—
Manitoba Oil and Gas Corp.	10	4
Rideau Petroleums Ltd.	6	13
Canadian Roxy Petroleum	5	5
Chevron Canada Resources Ltd.	5	9
Home Oil Company Ltd.	5	13
International Interlake Ind. Ltd.	5	—
Sceptre Resources Ltd.	2	—
Copperhead Oil Company Ltd.	1	—
Great American Energy Inc.	1	—
Lyleton Corporation	1	—
Pledge Petroleum Ltd.	1	—
Saskatchewan Oil and Gas Corp.	1	2
Voyager Energy Company	1	8
TOTAL	107	N/A

No. of Wells Drilled by Contractor:	1987	1986
Red Arrow Drilling Ltd.	35	42
Crown Drilling Ltd.	33	40
Sedco Drilling Ltd.	28	10
Big Sky Drilling Ltd.	4	6
Can Am Drilling Ltd.	4	21
Atco Drilling Ltd.	3	—
TOTAL	107	N/A

Table 12

1987 Annual Oil Production

By Operator	Vol. (m^3)
Chevron Canada Resources Ltd.	329 820.2
Omega Hydrocarbons Ltd.	168 341.3
Enron Oil Canada Ltd.	31 574.3
Tundra Oil and Gas	31 326.5
Newscope Resources Limited	26 973.6
Canada Northwest Energy Limited	24 297.7
International Interlake Industries Ltd.	24 213.5
Rideau Petroleum Ltd.	23 463.9
Canadian Roxy Petroleum Ltd.	16 767.3
Resman Holdings Ltd.	12 197.8
Samedan Oil of Canada Inc.	10 215.0
Home Oil Canada Limited	8 918.9
Mead Petroleum & Farms Ltd.	6 837.7
ICG Resources Ltd.	5 787.7
Voyager Energy Company	5 548.1
Saskoil Resources Inc.	4 956.4
Resman Oil and Gas Ltd.	4 854.4
Ranchmen's Resources Ltd.	4 550.4
Lyleton Corporation	4 197.6
Murphy Oil Company Ltd.	4 067.4
Can-Tex Drilling & Exploration Ltd.	3 691.1
Manitoba Oil and Gas Corporation	3 621.5
Triton Petroleum Limited	3 071.7
Koch Exploration Canada Ltd.	2 400.2
Suncor Inc.	2 247.0
Texaco Exploration Canada Ltd.	2 206.8
C.W. Cawston and Associates	2 130.4
Canamax Resources Inc.	1 765.6
Peregrine Petroleums Ltd.	1 611.8
John Deroy Gerrand Oil Syndicate	1 480.7
Other	8 669.5
TOTAL	781 806.0

By Field	Vol. (m^3)
Virden	318 193.7
Waskada	219 106.5
Daly	160 063.8
Pierson	21 646.3
Whitewater	19 266.7
South Pierson	12 246.6
Kirkella	8 573.8
Tilston	6 897.7
Lulu Lake	3 902.2
Souris Hartney	2 479.6
Coulter	1 007.2
Other Areas	6 843.4
Conf. Wells	1 578.5
TOTAL	781 806.0

Table 13

Department Publications

Manitoba

REPORTS

Bedrock Geology Compilation Map 53L	Oxford House — NTS 53L, 1:250 000, with marginal notes — Manitoba Energy and Mines
Geological Map ER87-1-1	Geology of the Flin Flon-White Lake area — A.H. Bailes and E.C. Syme
Geological Highway Map of Manitoba	MDA Special Publication No. 1 by M.T. Corkery (Map Committee Chairman) 0 — (Available in both English and French)
Economic Geology ER86-1	Gold Deposits of Manitoba — D.J. Richardson and G. Ostry
Mineral Deposit Series ER86-1	Mineral Deposits and Occurrences in the Flin Flon area; Part I: Mikanagan Lake Area (63K/13 SE) — G.H. Gale and D.R. Eccles
Petroleum Seismic Base Map Series	(Twps 1-46, Range 17E-29 WPM) 1:50 000
Geological Paper GP83-1	Subsurface disposal of waste in Manitoba; Part 1: Current status and potential of subsurface disposal of fluid industrial wastes in Manitoba — H.R. McCabe and D. Barchyn
Open File Report OF85-7	Industrial Minerals of Manitoba — W.R. Gunter and S. Segard
Open File Report OF87-1	Till geochemistry of the Seal River area, east of Great Island, Manitoba — E. Nielsen
Open File Report OF87-2	Glacial dispersal of trace elements in Wisconsinan till in the Dot Lake-MacLellan Mine area, Manitoba — E. Nielsen and M.A.F. Fedikow, M.A.F.
Open File Report OF87-3	Canada-Manitoba Mineral Development Agreement 1984-89 (ERDA) Sector A Geoscientific Activities, Progress Report 1986-87
Open File Report OF87-6	Results of the rock geochemistry survey of the Lynn Lake Rhyolitic Complex — M.A.F. Fedikow and K.J. Ferreira
Open File Report OF87-12	Preliminary results of a humus geochemical survey over the Rod Cu-Zn deposits, Snow Lake, Manitoba — K.J. Ferreira and M.A.F. Fedikow
Open File Report OF88-1	Bibliography of Manitoba Geology 2 — L.E. Chackowsky, Mines Branch
Aggregate Report AR86-1	The Aggregate Potential of Selected Paleozoic and Precambrian Rocks in Manitoba by C.W. Jones
Aggregate Report AR85-2	Late Wisconsinan Stratigraphy and Sand and Gravel Resources in the Rural Municipality of Lac du Bonnet and Local Government District of Alexander by G. Matile and H.D. Groom
Aggregate Report AR86-2	Aggregate Resources in the Rural Municipality of Shellmouth by H.D. Groom
Education Series	Mining in Manitoba (revised edition) — W.D. Fogwill and J.D. Bamburak, Mines Branch

Departmental Publications Cont'd

Petroleum Division

Petroleum Open File Report POF 4-86	Petroleum Geology of the Mission Canyon MC-1 Member, Tilston Field, Southwestern Manitoba (41 pages, 7 maps, 4 cross sections) — D. Bell
Petroleum Open File Report POF 5-86	Petroleum Geology of the Whitewater Field Area, Southwestern Manitoba (64 pages, 11 maps, 4 cross sections) — C. Martiniuk and M. Arbez
Petroleum Open File Report POF 6-86	Petroleum Geology of the Whitewater Field Area, Southwestern Manitoba — C. Martiniuk and M. Arbez
Petroleum Open File Report POF 7-86	Petroleum Geology of the MC-3 Member, Mission Canyon Formation, Pierson Field, Southwestern Manitoba — M. Husain and S.P. Halabura

Lynn Lake District

GS-1 Gold mineralization associated with the Johnson Shear Zone
by D.A. Baldwin

GS-2 Investigation of Agassiz Metallotext stratigraphy
by D. Parbery and M.A.F. Fedikow

GS-3 Geological Investigations at Burge Lake, Lynn Lake greenstone belt
by K. Ferreira

GS-4 Vegetation geochemical surveys, Lynn Lake and Bissett areas
by M.A.F. Fedikow

GS-5 Mineral deposit investigations in the Ruttan Lake area
by D.A. Baldwin

GS-6 Till geochemistry in selected areas of northern Manitoba
by E. Nielsen

Flin Flon District

GS-7 Athapapuskow Lake Project
by E.C. Syme

GS-8 Geological investigations in Tartan Lake-Lac Aimee area
by H.P. Gilbert

GS-9 Kisseynew Project: Kississing Lake
by D.C.P. Schledewitz

GS-10 Kisseynew Project: Limestone Point Lake-Star Lake area
by H.V. Zwanzig and P.G. Lenton

GS-11 Burntwood Lake syenite
by W.D. McRitchie

GS-12 Chisel-Morgan Lakes Project
by A.H. Bailes

GS-13 Project Cormorant: Sub-Paleozoic investigations south of Flin Flon and Swan Lake
by W. Weber and I. Hosain

Departmental Publications Cont'd

GS-14 Geology of the Leo Lake area
by K. Ferreira

GS-15 Mineral investigations in the Kisseynew gneiss terrain
by G.M. Ostry

GS-16 Mineral occurrence documentation and geochemical surveys in the Snow Lake area
by M.A.F. Fedikow and C. Malis

GS-17 Industrial Mineral occurrences in the Flin Flon, Snow Lake and Thompson areas
by W.R. Gunter and P. Yamada

GS-18 Geochemistry of granites in the Snow Lake-Flin Flon area
by N.M. Halden

GS-19 U-Pb zircon geochronology in the Flin Flon belt: Age of Amisk volcanism
by E.C. Syme, A.H. Bailes, T.M. Gordon and P.A. Hunt

Southeast Manitoba

GS-20 Geological investigations in the Lily Lake area
by W. Weber

GS-21 Investigations of Quaternary placer gold occurrences in the Manigotagan area
by E. Nielsen and R.N.W. DiLabio

GS-22 Mineral deposit investigations in the Rice Lake greenstone belt
by P. Theyer

GS-23 Platinum group elements in southeastern Manitoba
by P. Theyer

GS-24 U-Pb zircon geochronology of the Rice Lake area
by A. Turek, R. Keller, W. Weber and W.R. Van Schmus

GS-25 Dimension stone potential of southeastern Manitoba
by B.E. Schmidtke and D.I.D. Gaye

Thompson-Cross Lake District

GS-26 Cross Lake supracrustal investigations
by M.T. Corkery and H.D.M. Cameron

GS-27 Geological mapping at Pipe Mine
by J.J. Macek

GS-28 Geochemistry of Mafic volcanism at the Churchill-Superior boundary zone
by N.M. Halden

GS-29 Rb-Sr geochronology of the Churchill-Superior boundary zone and Cross Lake area
by G.S. Clark

Northern Superior District

GS-30 Granite and pegmatites at Magill Lake, Manitoba
by R.E. Meintzer, P. Cerny and P. Penner

GS-31 U-Pb geochronology program: Thompson belt-Northern Superior Province
by N. Machado, L. Heaman, T.E. Krogh and W. Weber

GS-32 U-Pb zircon geochronology of Bigstone Lake-Knight Lake area
by A. Turek and W. Weber

Departmental Publications Cont'd

Manitoba General

GS-33 Stratigraphic mapping and stratigraphic and industrial minerals core hole program
by H.R. McCabe

GS-34 Preliminary observations from a detailed geological investigation of the MacLellan Au-Ag deposit, Lynn Lake
by J. Gagnon

Mines Branch

ES-1 Manitoba's Precambrian drill core collection programs
by D.E. Prouse

ES-2 Compilation, promotion and exploration services
by J.D. Bamburak, D.J. Richardson and L.E. Chackowsky

AR-1 Aggregate resource inventory of the Rural Municipality of Louise
by R.V. Young

AR-2 Aggregate resources in the Rural Municipalities of Winchester and Morton
by H.D. Groom

AR-3 Surficial geology and aggregate inventory of the Cross Lake area
by M.A. Mihychuk

Preliminary Maps 1987
(released November 20, 1987)

Geological Survey

1987C-1 Subsurface Precambrian of Hudson Bay Lowland
by C.R. McGregor 1:1 000 000

1987F-1 Schist Lake (Parts of 63K/12W and 12E0
by E.C. Syme 1:15 840

1987F-2 Athapapuskow Lake (Part of 63K/12E
by E.C. Syme 1:15 840

1987F-3 Tartan Lake-Lac Aimee (Part of 63K/13)
by H.P. Gilbert 1:15 840

1987K-1 Kississing Lake West (63N/3)
by D.C.P. Schledewitz 1:20 000

1987K-3 Limestone Point Lake (Parts of 63N/1,2)
by H.V. Zwanzig, P.G. Lenton and B.S. Miller 1:50

1987K-5 Burntwood Lake Syenite (63N/8,9,10)
by W.D. McRitchie 1:4 200

1987N-1 Cross Lake Southwest (63-1/12 NW)
by M.T. Corkery and H.D.M. Cameron 1:20 000

1987S-1 Chisel-Morgan Lakes (Part of 63K/16)
by A.H. Bailes 1:15 840

1987T-1 Thompson Open Pit Mine-1C Pit Cross-section (Part of 63P/12W)
by J.J. Macek 1:500

Bedrock Geology Compilation Map Series, Preliminary Edition

— Kenora, NTS 52E
by C.R. McGregor, D. Kowerchuk and W. Weber

— Pointe due Bois, NTS 52L
by D. Kowerchuk and W. Weber

Departmental Publications Cont'd

Mineral Investigations:

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**Papers have been submitted, or are in the process of being submitted, on these subjects and will be included in a Symposium Volume to be published on the Trans-Hudson Orogen.*

Presentations

Manitoba Energy and Mines Annual Meeting with Industry, November 20, 1987

Review of Activities	W.D. McRitchie
Highlights of Provincial Mineral Investigations Program	G.H. Gale
Highlights of Provincial Geological Mapping Program	W. Weber
Applied Geoscience Research at the University of Manitoba	N. Halden
Mineralization in the Kisseynew domain — An update	G. Ostry/G.H. Gale
New Interpretation of the "Sherridon Group," Kisseynew domain	H. Zwanzig
Platinum Environments in Manitoba	P. Theyer

Other Presentations

Silicification, Fe-Mg metasomatism and synvolcanic plutonism, Snow Lake, Manitoba
by A.H. Bailes, at CIM Snow Lake and Flin Flon (April, 1987) and at GAC-MAC Annual Meeting, Saskatoon (May, 1987)

Till provenance as it relates to the glacial history of The Pas-Flin Flon area, Manitoba
by H. Groom and E. Nielsen at GAC-MAC Annual Meeting, Saskatoon (May, 1987)

Five years of till geochemistry in Manitoba — A Review
by E. Nielsen, AT WIUGC Winnipeg (January, 1988)

Stratigraphy and geochemistry of two Proterozoic arcs: Lynn Lake and Flin Flon metavolcanic belts, Manitoba
by E.C. Syme, at GAC-MAC Annual Meeting, Saskatoon (May, 1987) and at Geological Society of Saskatchewan, Regina (January, 1988)

The Churchill-Superior boundary zone: Constraints for the tectonic evolution of the southeastern margin of the Trans-Hudson orogen
by W. Weber, at GAC-MAC Annual Meeting, Saskatoon (May, 1987)

Project Cormorant: An attempt to delineate Precambrian basement geology beneath Paleozoic carbonates south of Flin Flon-Snow Lake
by W. Weber and T.M. Gordon, at GAC-MAC Annual Meeting, Saskatoon (May, 1987)

Stratigraphy and tectonics of the Kisseynew Complex, Manitoba
by H.V. Zwanzig, at GAC-MAC Annual Meeting, Saskatoon (May, 1987)

Exploration for PGE in Manitoba
by P. Theyer, at CIM [Local], Lynn Lake (September, 1987)

Uranium and Base Metal Potential in the Paleozoic rock of southern Manitoba
by G.H. Gale, H.R. McCAbe and E. Nielsen, at GAC-MAC Annual Meeting, Saskatoon (May, 1987).

An Overview of the geological setting of gold mineralization in the Churchill Province of Manitoba,
by G.M. Ostry, at CIM [Local], Thompson (April, 1987).

An Overview of the geological setting of gold mineralization in the Churchill Province of Manitoba,
by G.H. Gale, M.A.F. Fedikow and G. Ostry, at GAC-MAC Annual Meeting, Saskatoon (May, 1987)

Vegetation geochemistry and gold exploration in Manitoba
by M.A.F. Fedikow, at Prospectors and Developers Association Annual Meeting, Toronto (March, 1988; at CIM [Local], Lynn Lake (January, 1988); at CIM (Local], Thompson (February, 1988).

Field Demonstrations

Bailes, A.H. and Syme, E.C.
Field demonstrations of Flin Flon and Snow Lake geology in conjunction with the GAC-MAC Annual Meeting, Saskatoon, 35 participants, May, 1987 (5 days).

Corkery, M.T. and Cameron, H.D.M.
Field trip demonstrations in Cross Lake for federal government geologists and staff of Royal Ontario Museum (2 days in June).

Gale, G.H. and Ostry, G.M.
Field demonstration of Kisseynew terrain geology for two mining industry groups (June and July).

Nielsen, E.
Field demonstrations of Quaternary geology of Manitoba in conjunction with INQUA Meeting, Ottawa, August, 1987.

Macek, J.J., Weber, W. and Zwanzig, H.V.
Field trip demonstrations in Thompson (Thompson Pit), Sipiwesk Lake and Setting Lake for 20 members of FONB (Friends of the Nickel Belt) -- geologists from governments, universities and mining industry interested in new developments of the geology of the Thompson belt (3 days in June).

Table 14

Energy Consumption by Type of Fuel

Manitoba 1985 - 1987

(terajoules)

Type of Fuel	1985	%	1986	%	1987*	%*
Refined Petroleum Products	101,352	42.0	99,064	41.5	100,640	43.9
Natural Gas	76,494	31.7	74,556	31.2	65,492	28.6
Electricity	57,285	23.8	58,398	24.5	57,082	24.9
Coal and Coke	2,650	1.1	2,704	1.1	2,558	1.1
L.P.G.'s	3,095	1.3	3,632	1.5	2,933	1.3
Steam	272	0.1	429	0.2	346	0.2
TOTAL	241,148	100.0	238,783	100.0	229,051	100.0

Source: Statistics Canada, Manitoba Energy and Mines

Note: *Not adjusted for weather*

** Preliminary*

Table 15

Energy Consumption by End-Use*

Manitoba 1985 - 1987

(terajoules)

End-Use Sector	1985	1986	1987***
Residential/Farm	52,463	50,859	43,775
Commercial	48,136	47,638	41,888
Industrial	38,806	41,237	40,302
Transportation			
Farm Machinery and Equipment	9,829	10,970	10,788
Road	53,519	51,161	53,408
Rail	11,114	10,247	10,428
Air	6,899	7,087	7,257
Marine	20	15	12
Sub-Total	220,786	219,213	207,858
Non-Energy Use**	3,924	3,660	4,682
Energy Industry Use, Losses and Adjustments	16,438	15,910	16,511
TOTAL	241,148	238,783	229,051

SOURCE: Statistics Canada, Manitoba Energy and Mines

** Not adjusted for weather.*

*** Products such as asphalt and lubricating oils and greases which are used for purposes other than their energy content.*

**** Preliminary*